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Simplified Profit Reports

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No matter how busy an executive is, he must devote a considerable portion of his time to a consideration of company profits. He must determine the source of these profits as well as their size in order to shape intelligently the best policies for his particular business. The author presents a method of profit analysis especially suited to the needs of machinery manufacturers

THE objective of business is profit. For the purpose of profit control, resulting from analysis, let us segregate the various elements entering into the profit and loss report into three classes, representing the sources of these profits and losses.

A—Standard (Normal). *B*—Operating. *C*—Non-operating.

PROFIT & LOSS
The XYZ Manufacturing Co.
PERIOD First 1932

STANDARD			
Sales - Gross	$ 98,532		
- Concessions to Customers	1,408	$ 97,124	100.0
Cost of Sales - Manufacturing (At Standard Costs)	77,050		80.9
- Marketing Do	10,944	87,994	9.7
Standard Profit		9,130	9.4
OPERATING			
Material Variances (Actual under Standard Cost)	675		
Labor Variances Do	1,291		
Burden Variances Do	121		
Operating Profit		2,087	2.2
NON-OPERATING			
Interest on Investment (Taken into costs)	5,688		
Depreciation Variances - Buildings	1,046		
- Equipment	1,524		
Sale of Scrap and By-Product	376		
Profit on sale of Outside Investments	1,500		
Interest on Outside Investments	200		
Interest on Notes and Accounts Receivable	100		
Cash Discounts Taken	254		
Miscellaneous Income	465		
Total Non-Operating Income	11,153		
Plant Asset Disposal (Loss)	950		
Interest Paid	403		
Cash Discount Allowed	385		
Idle Capacity Expense	2,637		
Obsolescence	1,380		
Excess Capacity Expense	845		
Total Non-Operating Expense	6,600		
Total Non-Operating Profit		4,553	4.7
Net Profit		15,770	16.3

This form of profit and loss report is simple to prepare, easy to understand and tells the executive:

1. The standard or normal profits for any desired period. These profits being the difference between the actual sales value and costs as they should be (standard).

2. Gains or losses accruing from variations between expenditures actually made and what the same activities would cost with the plant running at normal. Under this plan, these variances are reported in the accounting period in which they occur instead of when the product is shipped.

The measurement of the company's volume of business, expressed in total dollar sales, does not always help the executive to establish sales policies that will pay dividends. Nor does the expression of volume, in total dollar sales for each class, help the executive as much as it should, unless the expression of dollar sales value is augmented by the profit for the class.

The costs of manufacturing and marketing are the costs under normal operating conditions, and with a balanced organization. Actual costs are not used in this profit report because actual costs in an unbalanced organization often bury irregularities caused by special conditions which a company's competitor may not have.

Machine classes Nos. 1 and 2 show

PROFIT & LOSS
By Classes of Product

XYZ Manufacturing Co. PERIOD First 1932

CLASS	Quan.	Sales	COST			PROFIT	
			Manufacture	Market	Total	Amount	%
Machines No. 1	10	$20,000	$ 16,080	$ 4,056	$20,136	$ 136*	.6
No. 2	4	9,000	7,227	1,622	8,849	151	1.7
No. 3	15	25,000	20,100	2,027	22,127	2,873	11.5
NO. 4	1	10,000	8,040	406	8,446	1,554	15.5
Total	30	64,000	51,447	8,111	59,558	4,442	6.9
Specialty		30,124	23,509	2,377	25,886	4,238	14.1
Repairs							
Castings Machined Singly		275	279	61	340	65*	24.0
Finished Stock Castings		258	172	38	210	48	18.6
Steel Parts Machined		240	126	29	155	85	35.4
Finished Stock Parts		1,465	1,021	224	1,245	220	15.0
Purchased Parts		375	195	43	238	137	36.6
Assemblies		387	172	38	210	177	45.7
Free Parts & Repairs		0	129	23	152	152*	100.0
Total		3,000	2,094	456	2,550	450	9.0
Total Standard Profit		97,124	77,050	10,944	87,994	9,130	9.4

*—Losses

PROFIT & LOSS
Material Purchases

PERIOD First 1932

Day	ACTUAL COST					Profit & LOSS	STANDARD COST		
	INVOICES						DIRECT CHARGES		
	Amount	Freight	Total	Defective	Good		Expenses	Work in Pro.	STOCK
1	$ 2,900	$ 100	$3,000	$ 36	$2,964	$ 136	$ 500	$ 1,000	$ 1,600
2	2,000	35	2,035	10	2,125	25*	100	1,000	1,000
3									
4									
5									
29									
30									
31									
Total						675			

an unsatisfactory profit, which probably resulted from either one or the other, or both, of the following causes:

1. Competing with less costly designed machines that perform the work of the customer with equal satisfaction. In such cases, the competitor can name a price to the customer that will, under normal operating conditions in the industry, return him a profit that would satisfy both his and the company's own profit ideals.
2. Unethical trade practices that demoralize the market so that satisfactory profit is impossible for anyone.

The function of this report has been accomplished when it indicates the profit results. Management must analyze the conditions in each case and apply the remedy, else the effort spent in compiling data for the report is lost.

Classified sales and profits reports may also be set up:

1. By types of business served
2. By types of customers
3. By customers
4. By items
5. By states
6. By territories
7. By agents
8. By salesmen

The same form is usable for these additional reports, and if the itemized costs are accumulated simultaneously with the sales values, the profits for each of these classifications may be easily obtained.

One of the divisions of Operating Profit is Material Variances. These variances measure the difference between the actual cost of the material and the results obtained from computing the material at market prices.

This report shows the management, in major detail, the actual cost of materials received from day to day during the accounting period, and the comparison with the standard or market costs for the same materials and the resulting variance.

Besides this managerial use, the report has two other functions:

1. It serves as a control sheet to tie up the cost accounting with the general books.
2. Journal entries are made from this report at the close of the accounting period.

The second division of Operating Profit is Labor Variances. These amounts measure the differences between the actual labor payments and the standard or allowed cost for such operations as standards have been established.

This report is a valuable control instrument for the management as it shows a daily accumulation of facts concerning the efficiency of employees working directly on the product. One report is maintained for the whole factory and supplementary reports for such departments as the individual shop conditions may warrant.

Besides its managerial use, this report has other functions:

1. It serves as a control sheet to tie up the cost accounting with the general books.
2. Journal entries are made from this report at the close of the accounting period.

The third division of Operating Profit is Burden Variances. These amounts measure the differences between actual expenditures and the budgeted amounts.

With this method of comparison of actual performance, against an established standard or budget, losses or excessive expenditures actually occurring can be detected, and executive action taken to eliminate them. One report is made for each division of burden, manufacturing and marketing, and also a consolidated report.

The method of applying actual burden costs of an

PROFIT & LOSS
Direct Labor

PERIOD First 1932

DAYWORK		DAY	STANDARD		ACTUAL		VARIANCE		% - VARIANCE	
Hours	Amount		Hours	Amount	Hours	Amount	Hours	Profit	Hours	Amount
195.	$ 117	1	1010	$ 610	770	$ 462	240	$ 148	23.7	24.2
310	186	2	800	480	.790	474	10	6	1.2	1.2
250	150	3	900	540	1000	620	100 *	80 *	11.8 *	14.8 *
76	48	4	1200	720	900	540	300	180	25.0	25.0
100	60	5	1100	660	800	400	300	260	27.2	40.0
		6								
		7								
		8								
		9								
		10								
		29								
		30								
		31								
		Total						1,291		

PROFIT&LOSS

Burden

PERIOD First 1932

	ACTUAL COST				BUDGET	COMPARISONS	
	Material	Labor	Burden	Total		Profit	%
Supervision							
Clerical							
Salesmen's Salaries							
Commissions							
Other Indirect Labor							
Repair Buildings							
Repair Equipment							
Supplies							
Accident Expense							
Shop Losses (Defectives, Scrap, Etc.)							
Employees Welfare							
Advertising							
Miscellaneous Development Cost							
Automobile Expense							
Power							
Traveling Expense							
Dues							
Charity							
Legal and Professional							
Telephone and Telegraph							
Postage							
Shipping							
Etc.							
Total						$ 121.	

accounting period to operations performed in the same period has been almost eliminated from industry. Normal burden rates are established, upon some basis, to relieve the costs of excessive burden in periods of low production and to add to costs in periods of high production. For better control of this very elusive element of cost, it is good practice to make comparisons, periodically, of the actual burden absorbed in the cost of the product and the normal established.

This report shows the management each week the monetary effect of departments operating under or over the normal time established for each. The machine department is further segregated into individual machines. In this particular shop, they work on a weekly payroll basis, and the logical period for this report is the same. However, these reports may be made at any period desired, whether it be at the end of each pay period or not, as the particular conditions in each plant indicate.

Companies operating with a single rate for all operations can compare the actual total hours and burden cost with a normal, but they are in no position to isolate the departments and machines where underabsorption or overabsorption occurs. Therefore, they are blocked in making analyses that might lead to more profitable planning and production.

The wise executive will study ways and means to eliminate every possible dollar of underabsorbed burden, for the existence of underabsorbed burden on the report indicates either losses caused by lack of normal business or poor operating planning. The former condition cannot often be remedied, but the latter condition can nearly always be improved.

For example: Machine No. 7, shown in the illustration, is not in use in production, but is absorbing its share of building space, equipment fixed charges, and other expenses. This report brings the cost of idleness to the attention of the management, who will either get profitable work for the machine or will sell it.

Too many systems of cost accounting do not furnish information for reports for executives which will materially assist the management in the control of the various activities of the business. On the other hand, too many systems furnish such information for reports, but the arrangement of the reports is such that it requires an unreasonable amount of the executive's time to make them usable. The reports that have been shown in this article are complete in important details, and yet so simple that the information contained therein may be clearly understood.

Some companies may want to break down the information shown on these reports, into more detail than here illustrated. This should cause little additional effort if the original data is properly coded and the most economical office equipment used in the collection of details into report form. Whenever possible to do so, the original information should be so arranged that the original data sheet or card may be used to accumulate costs of jobs, prepare journal entries for accounting procedure, and tabulate information for reports for executives.

The executives' mind is focused, as it should be, on earning profits for the company; reports of company activities must always reflect the relation of the activity to the profit situation of the company.

PROFIT&LOSS

Idle Capacity

PERIOD Week of Jan 2-1932

	NORMAL		USED		UNDERABSORBED	
	Hours	Amount	Hours	Amount	Hours	Amount
Engineering Department	600 0	240 00	650 5	260 20	50 5 *	20 20 *
Pattern Making	93 6	46 80	100 0	50 00	6 4 *	3 20 *
Melting	124 8	49 92	121 4	48 56	3 4	1 36
Core Making	124 8	162 24	119 0	154 70	5 8	7 54
Molding	779 0	779 00	650 1	650 10	128 9	128 90
Cleaning	249 6	187 50	210 0	157 50	39 6	30 00
Machining - Mch.No. 1	31 2	36 81	31 0	36 47	2	34
2	31 2	51 17	31 2	51 17		
3	31 2	91 10	20 0	58 40	11 2	32 70
4	31 2	81 12	35 6	92 56	4 4 *	11 44 *
5	31 2	19 97	31 2	19 97		
6	31 2	20 90	8 6	5 86	22 6	15 04
7	31 2	22 15	0		31 2	22 15
8	31 2	38 38	40 0	49 20	8 8 *	10 82 *
9	31 2	47 42	16 1	24 47	15 1	22 95
10	31 2	52 10	24 4	40 75	6 8	11 35
11	31 2	27 77	30 0	26 70	1 2	1 07
12	31 2	19 97	4 6	2 94	26 6	17 03
13	31 2	35 26	21 8	24 63	9 4	10 63
14	31 2	35 88	16 2	18 63	15 0	17 25
15	31 2	29 95	37 4	35 90	6 2 *	5 95 *
Others	1404 0	1829 85	1075 1	1362 51	328 9	467 34
Total Machining	1872 0	2439 80	1423 2	1850 16	448 8	589 64
Unit Assembly	312 8	218 96	222 6	155 82	90 2	63 14
Final Assembly	732 2	527 18	537 8	387 22	194 4	139 96
Shipping	93 6	46 80	85 0	42 50	8 6	4 30
TOTAL	4982 4	4698 20	4119 6	3756 76	862 8	941 44
*— Above Normal						

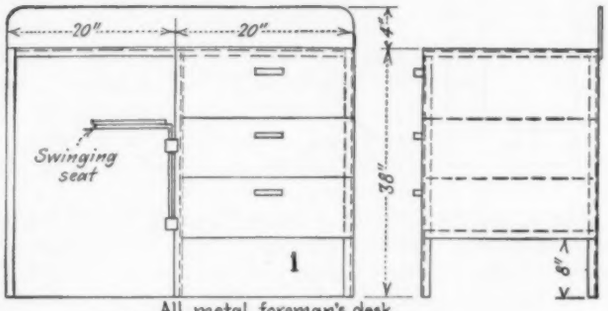
More Welded Shop Equipment

Being further suggestions for the welder in his spare moments

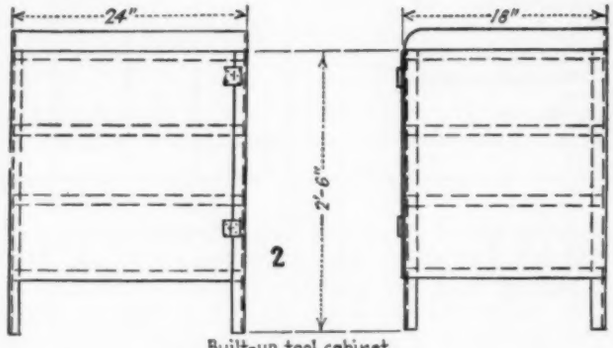
Contributed by A. F. Davis

Vice-President, Lincoln Electric Company

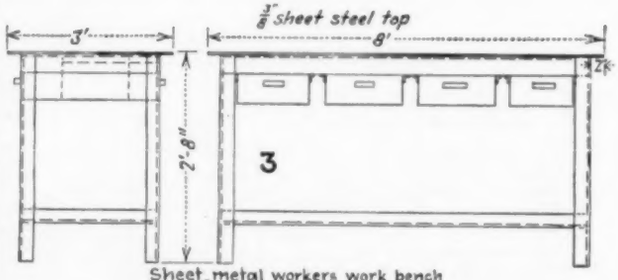
Drawings by Herbert G. Bossey



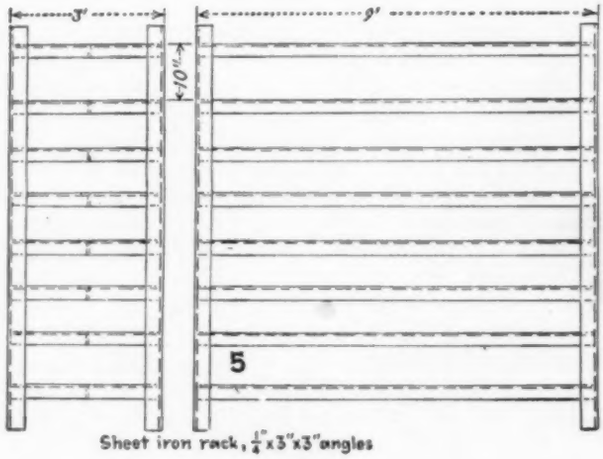
All metal foreman's desk
$\frac{1}{8}$"x1"x1" angles and 16 gage sheet steel



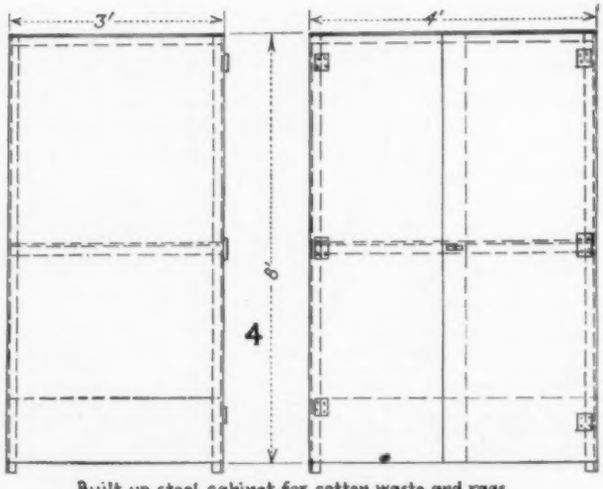
Built-up tool cabinet
One located at each machine
$\frac{1}{8}$"x1"x1" angle and No. 16 ga. sheet steel used



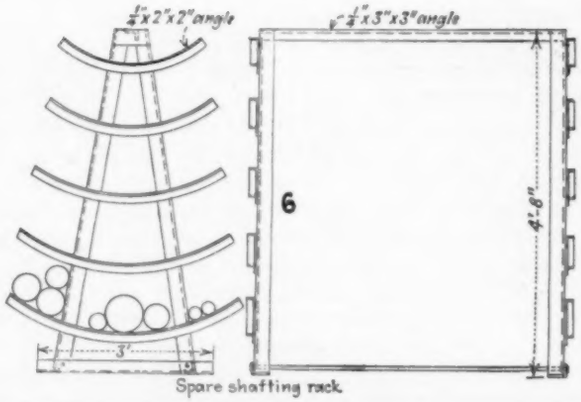
Sheet metal workers work bench
$\frac{1}{4}$"x2$\frac{1}{2}$"x2$\frac{1}{2}$" angles
Drawers made of No. 16 gage sheet steel



Sheet iron rack, $\frac{1}{4}$"x3"x3" angles

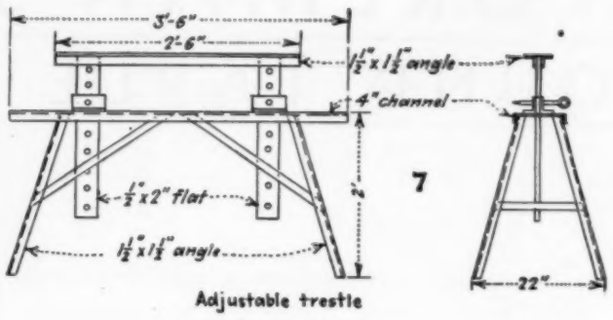


Built up steel cabinet for cotton waste and rags
$\frac{1}{4}$"x1$\frac{1}{2}$"x1$\frac{1}{2}$" angles and No. 12 gage sheet steel

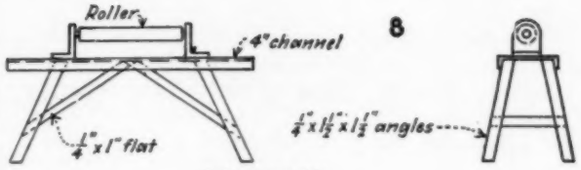


Spare shafting rack

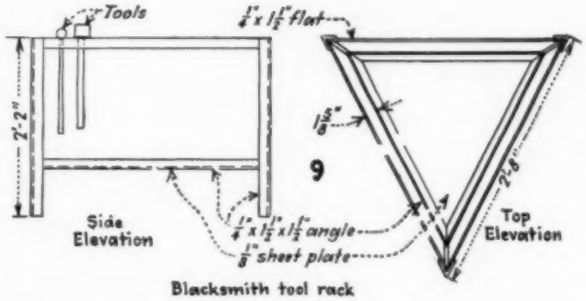
MORE WELDED SHOP EQUIPMENT



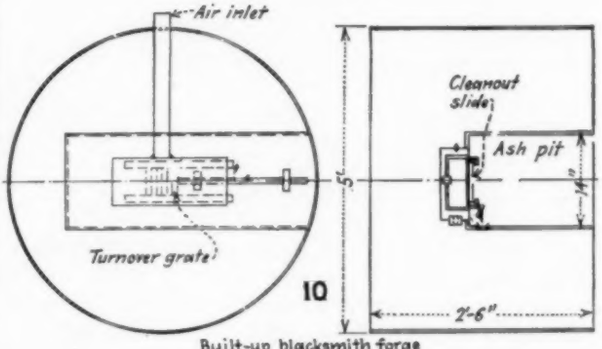
Adjustable trestle



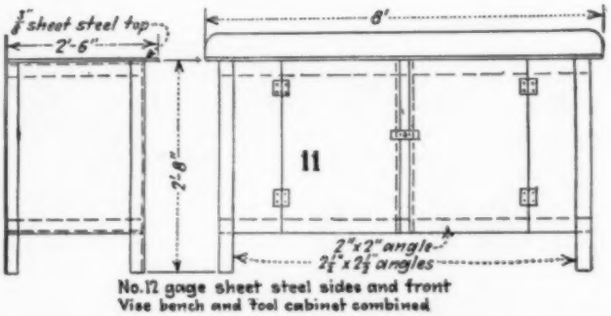
Roller trestle



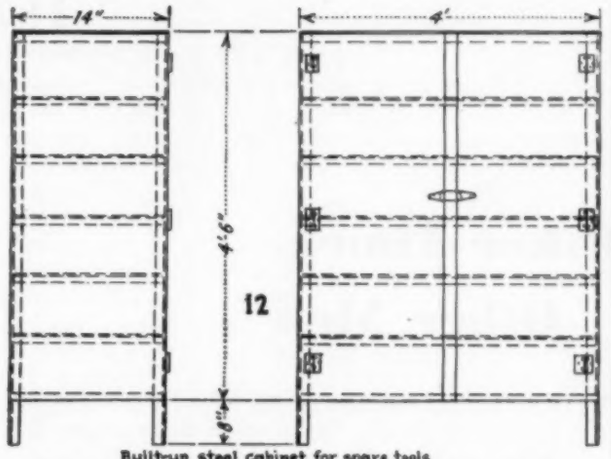
Blacksmith tool rack



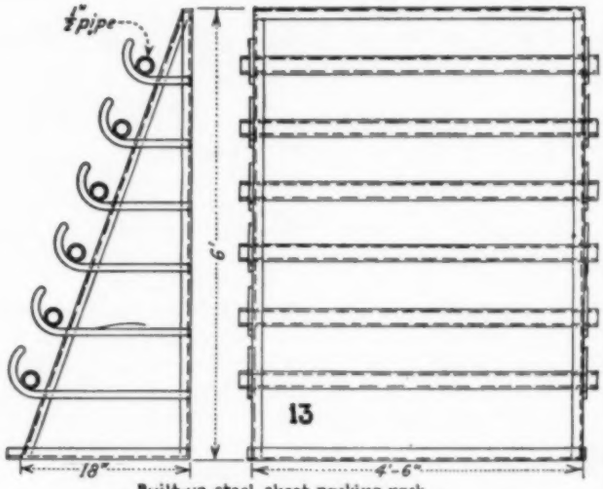
Built-up blacksmith forge
No. 8 gage sheet steel



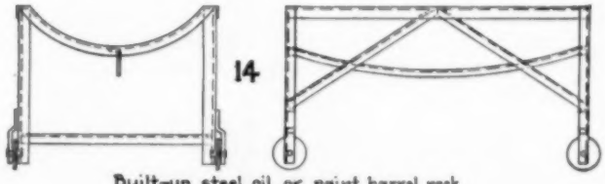
No. 12 gage sheet steel sides and front
Vise bench and tool cabinet combined



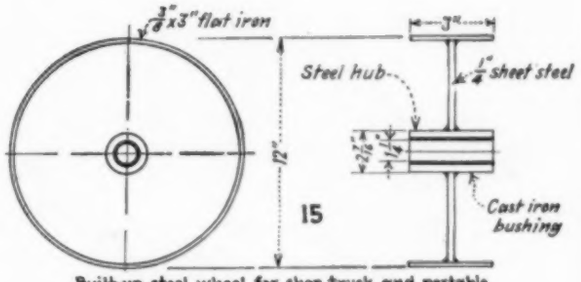
Built-up steel cabinet for spare tools
Four corner angles ¼"x1½"x1½", Shelf angles ¼"x1"x1", No. 16 ga. sheeting



Built-up steel sheet packing rack
Frame ¼"x1½"x1½" angle holders, ¼"x1¼" flat rollers 1" pipe



Built-up steel oil or paint barrel rack
¼"x1½"x1½" angles and cast iron rollers



Built-up steel wheel for shop truck and portable weld equipment

The FOREMAN'S ROUND TABLE

Other Times, Other Men

"SAY, AL," exclaimed his friend Ed as the two sat eating lunch, "Two more of my men left town last week."

"That's good," replied Al.

"Good! What do you mean, good? That wasn't a friendly remark, Al."

"Yes it was, more so than you think. I wish some of mine would leave town."

"My gosh, Al, you've been doing everything you could to hang on to your men, and now you want them to leave the city. How come?"

"I don't want all my men to leave town or even a majority, but when we begin to take on men again I'm going to hire a different class of men for lots of jobs I have. Things will be different, and I want different men."

"Yeah? How do you mean?"

"Well, that new industrial engineer happened to mention that he was fond of real down-east baked beans, so I invited him out to Sunday dinner. After dinner we took a walk and he told me lots of things I didn't know, and set me to thinking more about some things I did know about."

"What did I tell you? I knew it would be that way when you told me Williams had sold out the foremen by bringing in an outside man."

"I expected you to take that attitude, but it happens that we didn't discuss our own shop, or anyone in it. We just talked about the probable trend of general shop practice."

"Oh, too bad about that. But if he didn't suggest it, explain why you hope your good men leave town."

"I didn't say good men. I want to keep the good mechanics, but there are others I could do without."

"Again I ask, for the love of Pete, why?"

"Well, here's why: When business starts up, the enterprising shop executive is going to have an entirely different point of view. He'll have to. When business is good, management doesn't mind pampering its men, but when the treasurer starts to yell for cash to pay the firm's debts that we are piling up now, and the board of directors begins to demand the resumption of dividends, the slogan will change from 'keep the men contented' to 'keep the stockholders contented.' That means a new shop technique, and the foreman has got to unlearn many things he has thought gospel heretofore. Upon his ability to do this and to absorb the lessons taught by present conditions will depend his success. We have only been playing at management since the War, most of the improvements have been mechanical. I expect to have a tough time of it myself and I don't want a gang of men that buck and resent every change I make."

"If I didn't know you so well Al, I'd laugh. I don't see any changes they can make."

"Well this engineer told me of one firm that would not rehire its heat-treating gang, of an airplane firm that will not hire a man who has ever done welding, of others who are eliminating the kind of piecework we know and paying incentive only for loading on multiple machines. Others are putting time allowances on tool work and inspection. One manufacturer is building a series of identical plant units, each with a complete manufacturing staff. These will be run on a competitive basis, and when business slacks, the one making the poorest showing will be shut down tight and the staff laid off or fired.

"Another big man says his staff never learns anything after the first year they are with the firm and advocates a new one every year. Rather heartless, but playtime is over, big feller."

"I always told you that all that stuff you learned was bunk, Al. I don't have to unlearn anything."

Are we approaching a new era in shop management? If so, will it be easier to hire new men and train them than to retrain the old ones?

• Discussions

The Outsider

When the company is considering bringing in a consulting engineer to try and speed things up, all we seem to be able to think of is "outsider," disregarding the fact that here is a man who probably can help us help ourselves. Try as hard as we may, we cannot cover every small item of our jobs, and as we all have definite duties to perform there are naturally many things that get by us. No employer is hiring a consulting engineer because he thinks that his men are not capable. He is doing it because he knows that if we spend our time chasing one item of the business, our jobs suffer.

Now is the ideal time for such investigations, thus giving the consultant a chance to see more than he could at a time of high production. Under the present conditions defects in organizing show up.

I have been through many of the "consulting periods" with various companies, and have yet to see one case where some good to the employer and employee alike did not come from it. Instead of frowning on these men and putting obstacles in their way, we should welcome them, for while they are not infallible, we all can learn something from them.

—Charles R. Whitehouse.

Till it Hurts

Generally speaking, I am opposed to coercion, but in the world crisis of to-day I feel that there should be compulsion for all who are fortunate enough to have work, to keep their less fortunate brothers from starving.

Personally I do not care much for the giving of something for nothing. I prefer the system which has been adopted in this country; compelling each worker to insure for sickness, unemployment, and old age. That, to my mind is not charity and should not be called "the dole." There are thousands who would never take the care to provide for the evil day, and it is only right that they should be compelled to do so.

There are those who argue that it is the poor that help the poor and there are those who take the opposite view. I am inclined to think that both the rich and poor help, but I have decided views that the intermediate class, the salaried ones, shirk their share.

The salaried worker loses no time through trade depression, and is also exempt from making any contribution to the National Insurance. He is thus in a far better position than either the hourly worker or the employer.

It is strange to me that the foreman, who has risen from the ranks to a salaried position, should be unmindful of the fact that the workers are on short time, or perhaps unemployed. Usually, I have found them unconcerned by any existing poverty, and never willing to subscribe to any fund, the same being frequently true of salaried clerks and draughtsmen.

—A. I. Cook, *Essex, England.*

Service or Ability

Unless a man is hired specifically to fill an executive position, he should be given at least six months to prove himself before being promoted. A personal chart, allowing, for the sake of argument, 10 points for length of service, 20 for accuracy, 20 for speed, 15 for initiative, 15 for mechanical ability, 10 for adaptability, 5 for personality and 5 for punctuality would go a long way towards eliminating the personal equation.

Length of service in itself is not entitled to special consideration except as an indication of character. A man must be pretty good to hold a job through good times and bad for eleven years. Everything else being equal, length of service should count.

—L. B. Jones.

Carelessness

The man habitually causing or being in accidents is a doubtful asset. The probability is that when his services are most needed, he will be on the shelf due to one of his periodic accidents. The idea of giving a man a "call" or handing out some sort of punishment, classifies the employees as children with the management assuming the rôle of teachers. These chronic accident men should be removed from the payroll for their own good and the protection of the other workers.

The main difference between carelessness and an error of judgment is that carelessness is either laziness or lack of desire to find out the facts or conditions or have any regard for consequences; while an error of judgment may be caused by conclusions drawn from all available information with the keystone to the arch missing. An honest error of judgment is excusable; but a careless error of judgment should never be tolerated.

—E. E. Gagnon, *Mechanical Supt., U. S. Asbestos Division.*

Run-of-Mine

The amount of brain needed for shop work, except, perhaps, high class tool work, is less than that needed by draftsmen, but whether draftsmen actually have more is doubtful.

Often the man in a monotonous repetition job requiring no knowledge will be found to be a linguist or a mathematical wrangler. The very fact that his job needs no brain work enables him to take up a studious subject as a hobby and a change. The office man, using his brain all day, often takes up poultry rearing or gardening as a relaxation.

—Harry Shaw.
Lancashire, England.

Muzzling the Press

Ed maintains it is no one's business what the breed of men, typified by Joe Cook, think. I grant that, so long as they go no further than thinking, but when it comes to having opinionated, statements hurled at us in season and out, I think Williams is quite right to exercise a restraining influence.

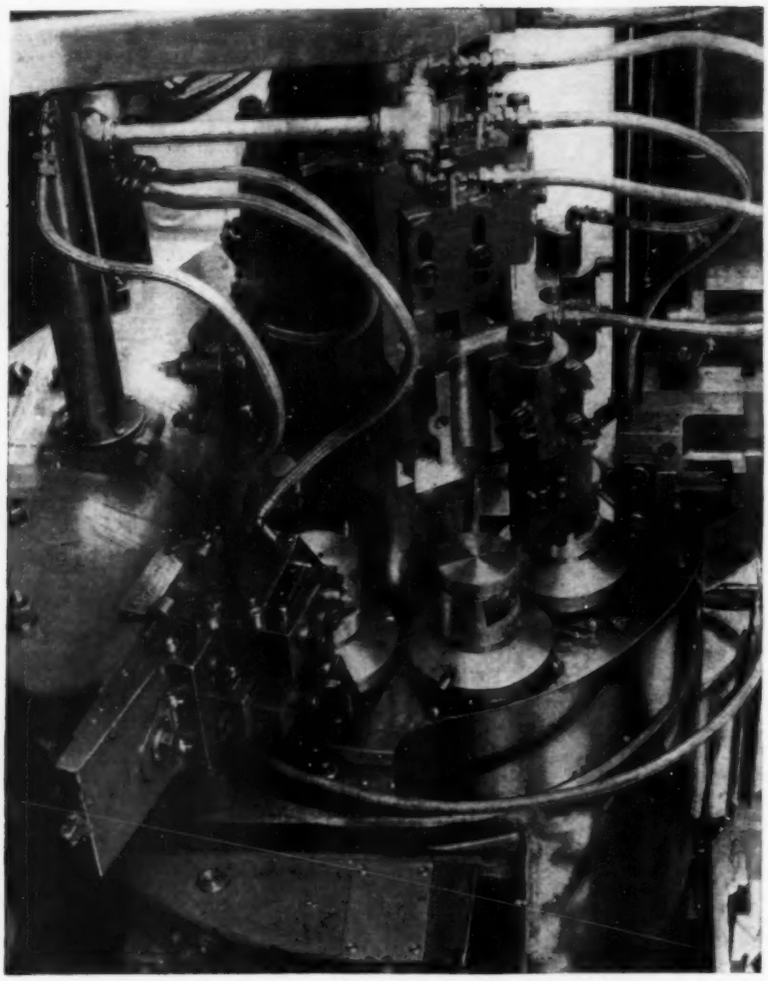
The majority of current topics are interlaced with politics. I have very small respect for consistent adherence to political principle. I do not know any political principle that holds independently of time and circumstance, for politics are only the adaptation of what is to what ought to be.

If you think what you always thought, and events move on, your position is changed for all that. But if you move with events your position is relatively unchanged.

—E. Wardle, *Durham, England.*

Machining an Aluminum Piston

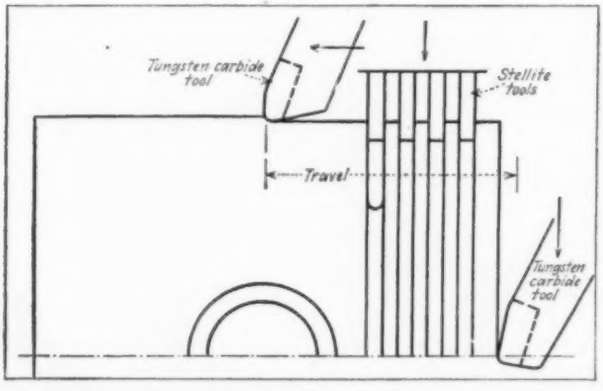
A. P. GWIAZDOWSKI
Assistant Professor of Shop Practice, University of Michigan



First position in Baird six-spindle chucking lathe. The pistons are held in the usual way by means of a pin in the wristpin hole

MODERN production methods are generally fascinating. The production engineer has coordinated the efforts of every known profession. Chemists, metallurgists, physicists, book-keepers, floor sweepers and tropical savages work towards the same goal, under the leadership of an engineer. The object of this coordination is to create a commercially perfect product at the lowest possible cost.

The rediscovery of high-speed steel by White and Taylor and its application to cutting tools marked a new era. The machine tool builder came out with machines capable of meeting the demand for high speeds, heavy feeds and deep cuts. The ability to create a rigid machine with numerous speeds and feeds, anti-friction bearings, positive oiling systems and all kinds of cutting tool movements, seems to have no limits. The demand for higher speeds and new materials of construction called for still better tool materials.



At the second position, the dome, piston ring grooves and the upper half of the outside diameter are roughed

The production engineer has a wide choice of tool materials: steel, Stellite, tungsten-carbide, tantalum-carbide and diamond. He also has a variety of machine tools from which to choose.

An aluminum alloy piston is one of the few machine parts employing steel, Stellite, cemented carbide, and the diamond. They all are used in performing the turning, facing, chamfering, grooving, and boring operations.

In his "Comparison of Piston Practice" (*AM*, Vol. 74 page 903), the author has shown that manufacturer "A" completely machines an aluminum alloy piston in about 2½ min. The ingenuity of the tool engineer, single-purpose machines, together with high-class jigs, fixtures and special devices accounted for this exceptional accomplishment. The importance of the machine tool builder and the utilization of the most advanced cutting materials by the automobile manufacturer, omitted at the time, are now discussed.

The combination of properly designed machines with the tool materials previously mentioned, for the purpose of obtaining the product of highest quality at the least expense is worthy of careful study.

Machining Cycle

The following operations are performed on one machine:

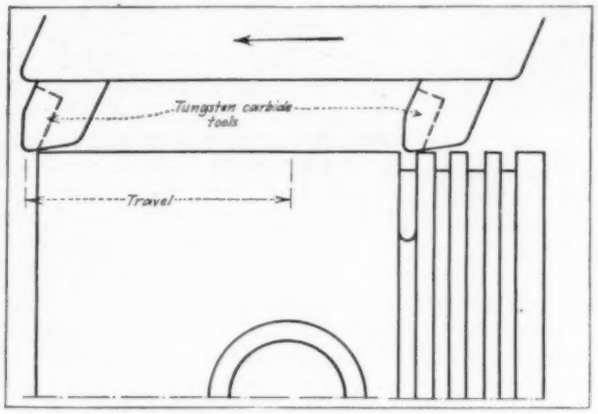
1. Rough and finish turn the piston casting.
2. Cut ring grooves.
3. Face dome.

The Baird six-spindle horizontal chucking lathe, Fig. 1, was selected for the work. The selection of the proper cutting tools was the next thing to be considered. The quality of a cutting tool depends upon such factors as chemical composition, method of manufacture, grinding.

Tool quality governs the length of time the tool will cut between grinds, the finish the tool will produce, and the power that should be used.

A careful analysis of conditions resulted in the decision to use the following cutting materials for machining the piston and boring the wristpin hole—high-speed steel, Stellite, tungsten carbide and the diamond.

Originally, the Baird lathe was designed so that the time from floor to floor for each piston was only 13 sec.



The third operation finishes the roughing of the skirt and undercuts the lands slightly

It was necessary, however, to reduce the speeds, and at the present time the complete cycle is performed in 26 sec. (manufacturer "A's" time).

First Position—Chucking

Pistons come to the machine with the bottom and the inside of the skirt finished and the wristpin hole bored. A piston is located by the inside bore of the skirt. The holding pin is inserted through the wristpin hole and drawn down to secure the piston. The piston center, used by some manufacturers, is eliminated in this case, and the number of machining operations is reduced.

Second Position

Operation (a) Rough turn the outside diameter from the piston dome to the wristpin center line.
Operation (b) Rough face the dome.
Operation (c) Rough turn the piston ring grooves.

A tungsten-carbide tool is used for rough turning and rough facing. Stellite tool blades are used for grooving.

Speeds and Feeds

LONGITUDINAL SLIDE	Feed = 0.014 in. per revolution
Turning outside diameter	Tool travel-= $2\frac{1}{16}$ in.
Cutting speed = 459 ft. per min.	
CROSS SLIDE	Feed = 0.025 in. for $1\frac{11}{16}$ in. and 0.004 in. for $\frac{3}{16}$ in.
Facing the dome	Tool travel = 2 in.
Cutting speed = 459 ft. per min.	

Note the reduction of feed from 0.025 in. per revolution to 0.004 in. per revolution as the tool approaches the center of the piston. A special mechanism governs this change of feed.

Third Position

Operation (a) Complete the rough turning of the skirt.
Operation (b) Undercut lands at the piston head.

Speeds and Feeds

A longitudinal slide is used to perform operations (a) and (b). The speed and feed are the same as in the second position, namely, cutting speed 459 ft. per min. and feed 0.014 in. per revolution.

Fourth Position

Operation (a) Finish face piston dome.
Operation (b) Chamfer upper and lower lands.

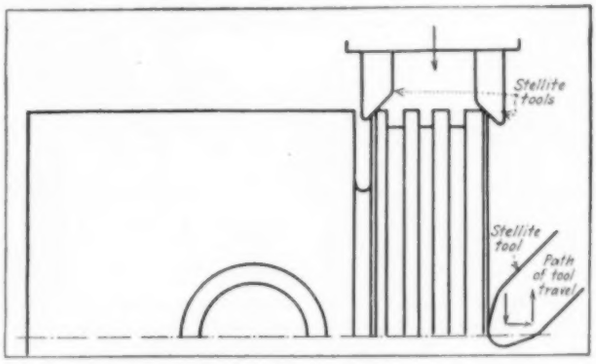
After the cutting tool passes the piston center it moves $\frac{1}{16}$ of an inch away from the finished surface and returns to the original position without touching the dome.

Speeds and Feeds

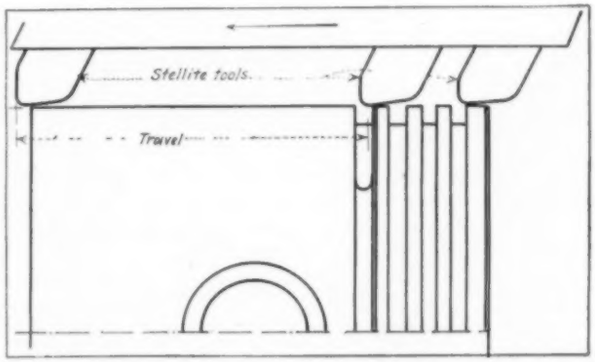
A cross slide is used. The cutting speed is 814 ft. per min., feed 0.0094 in. for $2\frac{1}{8}$ in. and 0.0016 for $\frac{1}{16}$ in. The tool travel is $2\frac{3}{16}$ in.

Fifth Position

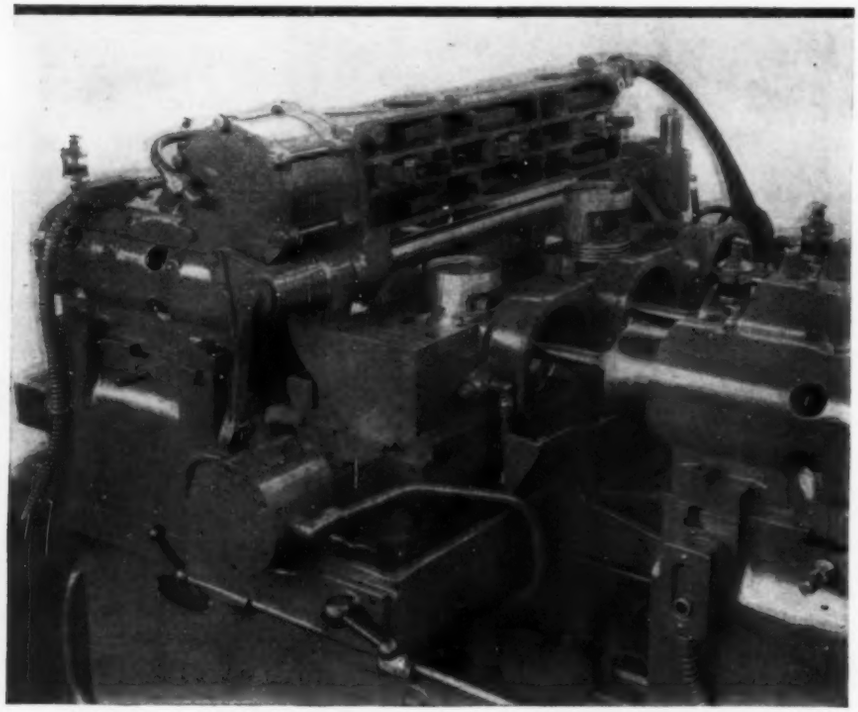
Operation (a) Concentric finish turn skirt.
Operation (b) Finish turn lands.



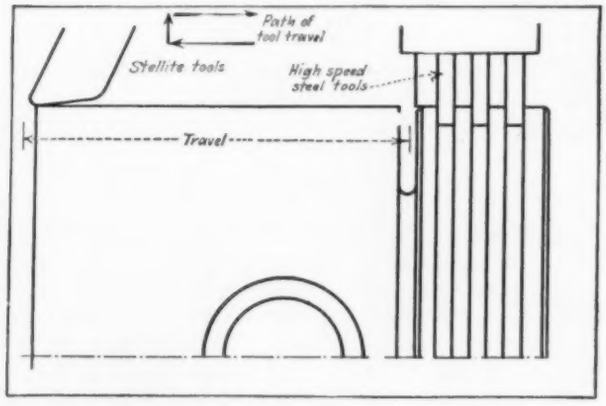
Position No. 4 finishes the dome and chamfers the two outside lands. The dome finishing tool backs away from the cut before it returns to its original position



The finishing cut on the outside diameter and lands



The final operation on the piston is to diamond bore and finish the wristpin hole. The pistons are held in pot fixtures and automatically ejected when finished



At the sixth position the skirt is tapered and the piston ring grooves and lands are sized. The time for the cycle is 23 seconds

Speeds and Feeds

Longitudinal slide is used. The cutting speed is dropped to 457 ft. per min., and the feed is 0.020 in. per revolution. The tool travel is $2\frac{5}{16}$ in.

Sixth Position

Operation (a) Taper finish turn skirt.
Operation (b) Finish turn ring grooves and top of lands.

Stellite, grade No. 2, turning tool and hammered high-speed steel grooving tools are used. At the end of the stroke the tool moves $\frac{1}{16}$ of an inch away from the piston and returns to its original position.

Speeds and Feeds

Longitudinal and cross slides are used.

LONGITUDINAL SLIDE
Taper finish turn skirt
Cutting speed = 456 ft. per min.
Feed = 0.020 in. per revolution
Tool travel = $2\frac{5}{16}$ in.

CROSS SLIDE
Finish turn ring grooves and top of land
Cutting speed = 456 ft. per min.
Feed = 0.0015 in. per revolution
Tool travel = $\frac{7}{32}$ in.

Diamond Boring Wristpin Hole

The boring is performed on the Ex-Cell-O diamond boring machine. This machine was designed to remove $\frac{1}{16}$ in. of stock during rough and finish operations. On the finish cut from 0.006 to 0.008 in. of stock is removed. The speed of the boring units is 3600 r.p.m. The feed per revolution of the spindle is 0.004 in. for rough cuts and 0.002 in. for finish cuts.

Competition calls for high-grade engineering skill and unusual production methods. The market is just as good, and as a matter of fact it is better today than it was a generation ago, for those who are able to produce a real article. High-class engineering and tedious research must stand back of the product.

Obsolete machine tools with their slow speeds and light feeds, even if they are revamped, are not able to compete with a tool designed for high production. The proper choice of tool materials for the selected machines should be the subject of profound study.

Tool Steel Economies—*Discussion*

ARTHUR SILVESTER
Manager, The Iten Fibre Company

In an article under the title given above (*AM*—Vol. 75, page 497), Harry Shaw states that the usual claim of people who advocate toolholders and tipped tools is the saving of steel obtained by their use, and then asks if there is really any saving of metal by this means. The article informs us that a certain concern has discarded all its toolholders and tipped tools in favor of solid tools (except in small sizes), and that when the largest sized tool has been ground and reground until it is too short for further use, it is drawn out by a power hammer to the next size smaller.

There is not only a saving in metal by the use of toolholders, but also in the money invested in tools. There is also a considerable saving in the wear and tear of the grinding wheel. The small toolbits used in holders are far easier to grind and more adaptable for use than are solid tools.

By the method advocated by Mr. Shaw, workmen used to spend half their grinding time in grinding off the hammer bumps that some blacksmiths would leave on the business ends of the tools, even if they had the use of a power hammer. By far the majority of shops do

not possess such a machine. It is a fact that every time a tool is put in the fire it deteriorates. It would take a blacksmith fifteen minutes to reduce a 1½x1-in. tool to 1¼x¾ in., and his wages, plus the cost of power, etc., would easily pay for two toolbits ¾ in. square and 4 in. long.

The use of toolbits has also made possible the standardizing of all bars and toolholders to take certain sizes. Today, instead of seeing a small- or medium-sized machine cluttered with two or three dozen heavy, awkward tools, we now see a box of toolbits and several toolholders, thus saving space and time. With solid tools, if a casting is to be machined on the inside, it is necessary to get the blacksmith to offset a tool for the purpose, while a right- or a left-hand toolholder can be selected, a toolbit slipped in, and the job done at once.

When solid tools were in general use, every foreman has known men to spend half an hour at the grinding wheel to make a tool workable, and often when the workman came to use the tool, it broke, either because of faulty hardening or an inherent fracture in the steel. All this waste of time has been eliminated by the scientific control in hardening and the use of modern toolholders and toolbits.

Cracks in Driving Axles—*Discussion*

F. M. A'HEARN

THE ARTICLE under the title given above (*AM*—Vol. 75, page 961) describes some interesting methods of detecting incipient fractures in the driving axles of locomotives. In the first paragraph, reference is made to the practice of heating the axle to normalizing temperature, and while cooling, to brush water over the surface. Does this method have any advantage over the one mentioned in the second paragraph; that is, to coat the surface with whiting and locate existing cracks by the discoloration of the whiting where the oil seeps out from them?

Cracks in wheel fits, or seats, are more common in axles having a wheel-seat diameter smaller than the diameter of the driving-box bearing than they are where the diameter of the wheel fit exceeds that of the bearing. In the majority of cases, modern locomotives have enlarged wheel fits. In this connection, it is interesting to note that when driving wheels are removed from axles having reduced wheel fits, it is common to find a short section of the inner end of the wheel fits presenting a worn or polished appearance. At the end of the worn section and at the beginning of the fit proper, the fractures will usually be found. If an old axle in this condition is placed in the lathe and a cut is taken over the wheel seat, circumferential fractures are frequently found. In removing the metal, a tool having a cutting edge set at 90 deg. to the center line of the axle will sometimes disclose a fractured face equal to the depth of the cut.

The change in the shape of the keyways, as described in the article, may reduce the tendency to breakage. On the other hand, the fractures often commence between the end of the axle and the inner end of the keyway, away from the termination of the keyway. In the majority of cases, however, where the fracture passes through the keyway section, it will be found that the keyway is located between the center of the axle and the crankpin. In locomotives of recent construction, the keyways are usually located at a point 180 deg. from the crankpin side. As the pin side of the axle is in tension during the admission of steam, and also during the expansion events of the piston stroke, it is apparent that any reduction of metal in the axle next to the pin, as well as the shape of the keyway at its termination, will have an important bearing on axle breakage.

The design of many driving-wheel centers is such that when applying a new wheel center, the keyway in the wheel may be located opposite to the pin. In such cases, however, it has been overlooked that if only one keyway or one wheel is changed, the pin lead will be changed from right to left or vice versa. It is important that this be borne in mind.

Examination of axles broken in the wheel fit almost invariably indicate that the nature of the fracture has been progressive.. The fracture seems to start at a point nearest to the crankpin, and usually works well beyond the center of the axle before the axle separates. Well-defined zones indicating the slow progress of the fracture may be observed. At the point where the fracture commences, the metal presents a worn appearance as if caused by repeated opening and closing of the fracture as the axle springs, resulting in a pronounced wear of the surfaces alternately separated and brought together.

Wheel-fit fractures have presented a difficult problem for the shop man. Owing to their location ,they are difficult to detect without dismounting the wheel, or at least pressing the axle part way out of the wheel fit in order to uncover the breakage zone. Objections to this practice are possible quartering errors and also loosening of fits.

Experiments have been made to detect fractures by drilling a hole to penetrate beyond the breaking zone, parallel with the center line of the axle and between the center and the side nearest to the crankpin. Colored fluid forced into this hole under pressure was intended to be forced out through the fracture, and by its presence at the inner end of the wheel fit reveal existing fractures. However, this method, whether successful or not, does not seem to be generally practiced.

The enlarged wheel fit seems to offer the best solution of the broken wheel-fit problem. In its absence, it will be found advisable to test dismounted axles of the reduced wheel-fit type, and establish by the age of the axle a probable age limit or mileage limit for removal purposes. Either the whiting test or a cut taken over the fit should show any fractures. Age can be determined by date of application. In accordance with the inspection rules of the Interstate Commerce Commission, all driving axles placed in service since January 1, 1916, must have the date of application stamped on one end.

If old axles are reworked for other uses, it will be found advisable to discard the wheel-fit ends, and in many cases, the journal sections as well. The middle sections of the axles usually give good service when reused.

A Model Inspection Room in Russia

WALTER WELLS

IN MOSCOW, Soviet Russia, there is located the now well-known establishment called "Orgametall." This organization has various branches, among which is one called "The Factory for Jigs and Dies." This factory is in reality an especially large "job shop," as the term is used in the States. Its schedule is filled with the orders for the many types of dies, jigs, fixtures and tools used in the many new industries of the U.S.S.R. With all the comings and goings of engineering and executive staffs from the outlying corners of the vast country to this factory, it is but natural that a great deal of interest should be displayed in the methods and equipment of its inspection department, as such.

The chief of this inspection room being a Russian with quite a few years of American training, it is not odd that we find a large proportion of American-made measuring and precision instruments. He has built this department up carefully, according to his own idea of what equipment an inspection room should have. And the numerous delegations who visit this factory and inquire about the functioning of the tools, invariably go away with detailed lists of the entire outfit—firm trademark included.

As we enter the inspection room, the first thing we notice is a brand new Brown & Sharpe 42-in. x 42-in. surface plate. An inspector is checking up a rather large jig with a Starrett height gage. From the lower registering point to the inserted Brown & Sharpe taper parallel gage is about 22 in., yet he gets the reading directly because he is equipped with a 500-mm. height gage (about 24 inches). He favors the "Last Word" indicator, though the men in the shop have the opinion that the "Ideal" is better, when there are a lot of apprentices around.

Just at this point the American visitor might begin to feel a little too necessary as a part of the mechanical scheme of things. But, as if to smash this illusion, our friend the Russian inspector reaches over to a rack and picks out an arbor from a set ranging between 5 and 50 mm. They are marked "made in Germany." He gets his required reading with a Zeiss micrometer. The arbors progress in steps of 0.1 mm., while the set of eight "mikes" goes from zero to 300 mm. The micrometers are of the oversize type, sandblasted over chromium plate to avoid glare along the graduations.

A batch of die parts come in from the hardening room. One of the apprentice girls immediately sets the Shore Scleroscope on a bench and jots down the several readings. The chief, a little anxious about results, tries a file on some of the parts, too. He is just a little bit practical, this fellow.

Over in the corner is a cabinet weighted down with fine tools. We see the familiar American makes of scales, try squares, calipers, indicators and protractors. The whole range of fillet and thread gages and feeders fills a set of cubbyholes. In this section the atmosphere begins to get a bit more international. Russian vernier calipers and small height gages are neatly arranged alongside the Swedish gages. The Johansson blocks are in the metric scale as are the German special thread micrometers and all other instruments with graduations. While the 1-meter vernier caliper (39 in.) comes from New England, some of the bevel protractors with optical verniers originated in Jena.

There is a German surface plate with a pair of center heads and a Tee slot for checking work of a sort. At times the heads are pushed aside and a Zeiss optical dividing head is utilized in getting angular readings down to 30 sec. accuracy. A diemaker is just now laying out his templet for a 42-section lamination die on this device.

For the gage work, there is an anvil-type gage, reading to 0.0005 mm. The setting is effected by a sensitive screw adjustment in conjunction with a Johansson block and the built-in indicator. This is not made in Russia and is not likely to be in the near future. Yet they will need tools like it on the Volga, in the Urals and also in places not so remote.

The Russian shops have a technological system, as they term it, which governs the routing of every tool in the process of manufacture. The rapid development of apprentices under this system is intimately connected with inspection. A scheme of floor inspection and parts inspection relieves the newer men of a great deal of responsibility. All work from the machines must be inspected before it can be sent on to the toolmakers at the bench. Then there is an assembly inspection, with the final inspection as a counter check. Work that is to be sent to the hardening room is passed upon to fix responsibility in case of shrinkage or water cracks. Die blanks and other tool steel blocks that are to be made up into expensive forms are thoroughly examined under a glass for flaws that would tend to weaken the finished product.

Will the large proportion of American equipment be maintained under prevailing commercial relations between Russia and the United States?

Allowances for dies and jigs depend a lot on the nature of the operation. The average tolerance on jig bushing center-to-center distances is 0.05 mm. (0.002 in.). Piercing holes in dies, about the same. On some dies for cutting heavy metal 0.1 mm. is close enough. Then there are some jigs and dies where only the very closest limits are allowed, not more than 0.02 mm. (less than 0.001 in.). Gages are held to 0.002 mm. (less than 0.0001 in.). Our scale measurements have a counterpart in their readings on a slide scale to 0.2 mm. (about half a 64th).

Constant reference is made to American handbooks, toolmaking texts and current literature in the course of

this inspection room's day's work, in spite of the fact that a Russian translation of a Schuchardt and Schütte handbook is considered official for Russia, as for instance, in the making of taps for production use, or in the matter of allowances. Also, for calculations in spacing circles, trig, etc., it is standard.

All in all, this inspection room, combining as it does tools from the U. S. together with those from countries not so far away from Russia, is the chief point of interest to managers and their staffs when they visit this tool shop. Now the question is, will this large proportion of American tools be maintained in the future inspection rooms throughout Russia? Or will the unfavorable trade conditions now prevailing between the U. S. and that country cause larger and larger orders to be switched to Germany?

Accuracy with Calipers

E. CHAT SHANKS

PERHAPS one of the most controversial subjects in any shop is: How close should a machinist be required to measure with calipers? The variety of opinion is nearly as great as the number of persons who reply. Replies vary from plus and minus 0.002 to plus and minus $\frac{1}{64}$ in.

This article refers only to dimensions measured with a standard steel scale, graduated to sixty-fourths of an inch, and either inside or outside calipers. Decision as to what is a reasonably accurate caliper measurement must be of an arbitrary nature, and each ruling must be suited to the requirements of the individual shop. Therefore, no attempt will be made to set limits for caliper measurements. The purpose is to point out what can, and what can not, be expected, with examples drawn from actual experience.

On pages 373 and 374 of the "American Machinist Handbook" will be found information relative to caliper measuring. Tables are given covering the amount of side play required to produce various fits, the side play of calipers having been at one time the recognized way of securing the desired fit between mating parts. The accurate results obtained by this method are a surprise to those who have never used it. Usually the internal mating part was turned and measured with outside calipers. Inside calipers were then set to the outside ones and the external part bored to them. Loose fits were obtained by allowing a predetermined amount of side play perpendicular to the axis of the part, or crosswise of the hole. Tight fits, by inclining the calipers at an angle to the axis, lengthwise of the hole.

Measuring Large Diameters

It may be said that in the modern shop there is no longer need for accuracy in measurinig with calipers since other instruments, or gages, are at hand for close limit work and that calipers are only to be used on rough dimensions. This statement is true in most instances, but occasionally the need arises for close work in a size for which the more easily used tools are not available. This condition occurs more frequently in the small shops than in the larger ones, but all must meet it. Particularly is it true in measuring large diameters. Even in calipering so-called rough dimensions, the degree of accuracy which can be reasonably expected is dependent upon the ability of the individual machinist and his understanding of the use of calipers.

There are, chiefly, four essentials to accurate caliper measurement. The first of these is to have proper points on the instruments. Second, the calipers must be closely set to the correct dimension. The third essential is measuring on the true, or required, diameter. Last is the cultivation of a sensitive touch suitable to correct calipering.

When new, calipers have correctly ground points, and one can easily observe the type of point required. Outside calipers may have points which are either a portion of a cylinder or a portion of a sphere. Inside caliper points should always be a portion of a sphere. The radius of the curve on the latter should be smaller than the smallest diameter to be measured. The above observations are familiar to every machinist. However, calipers wear and so must be reground and care should be used in reshaping the points. Accurate measurements should not be expected from calipers with deformed ends.

Seems Difficult, Is Simple

The second requirement is the one which seems most difficult, but it really is surprisingly simple. The scale should be sufficiently new that the ends are not worn off and, preferably, graduated in sixty-fourths of an inch. Look at it closely. Assuming that $\frac{1}{64}$ of an inch is equal to 0.015 of an inch, the width of each graduation groove is about one-fourth of the total center to center space, or a little less than 0.004 in. The grooves may be one-third to one-fifth of the 0.015-in. distance, depending upon the style and make of scale. Whatever it is, the width can be estimated sufficiently close. If the width is 0.004 in. and the calipers are set any place inside the width of the mark, the setting will be within $\pm$0.002 in. of the required dimension. Of course it is necessary that the eye look squarely across the caliper point, i.e.; that the eye and the point be in a line perpendicular to the scale. In the case of inside caliper settings, it is further necessary that the scale be held squarely to the object on which it rests. A little practice will soon enable the machinist to obtain results closer than $\pm$0.002 inch.

Machinists recognize the necessity of measuring on the true diameter. A slight inclination of the calipers will give undersize internal measurements and oversize or undersize external measurements depending upon whether the inclination is crosswise or parallel to the axis.

The fourth requirement need hardly be discussed. It can only be acquired through practice. Accuracy of touch can be checked by verifying the results obtained by means of further measurements with precision instruments.

Several years ago, there was an argument in the inspection department of a well-known company on this subject. The matter was taken up with the superin-

tendent who suggested that a test be conducted. During the next three days, each of the inspectors asked different machine operators and bench hands, including those in the tool room, to help him by setting a pair of calipers. After being set, the calipers were taken to the inspection office and checked with micrometers. A table kept of the results was found most amusing; the greatest error being made by one of the best lathe-hands in the plant. Then the test was explained to each man who had been tested previously, and he was given three more chances. The three readings were averaged and the new figure set down after his name. Nearly all were inside of ±0.002 in. The inspectors and foremen also were tested. One man made six consecutive settings to various dimensions within ±0.0075 in. The test resulted in a new method of dimensioning drawings and relieved the inspectors from the necessity of making individual arbitrary decisions.

In this same factory, there arose an occasion to check some gear stud centers which had been incorrectly machined, so that eccentric bushings could be made. The man who had the record of ±0.0075 in. was called upon to determine the required eccentricity and used inside calipers for the purpose. The superintendent happened along and doubted that the measurements just completed were sufficiently correct. The centers were rechecked with gage blocks and the greatest error was +0.001 of an inch! The caliper and scale figures had been sufficiently accurate.

In another plant, a light tapping fit was required for some large work. There were two bores and two cylindrical internal parts which were required to be interchangeable. The mechanic who did the work had learned his trade in a small country shop. He bored the two holes to calipers and from them set the outside calipers, to which he turned the internal parts. The desired fit was secured without scraping!

The question of reasonable limits on caliper dimensions came up recently in another plant. An engineer stated that it was possible to set calipers within ±0.0015 in. to an ordinary steel scale. Some of the hearers were amused. He offered to prove it and made five trials each of which checked within the limits he had specified. He then calipered several holes and outside diameters, reading the dimensions on a scale, and was outside the limit but once. This created a new respect for calipers.

Slotting Die

with Independently Adjusted Units

HERBERT CHASE
Consulting Engineer

SLOTTING dies are not costly to make, but they can be very troublesome to operate. In shops where considerable slotting is done frequent attempts have been made to devise an adjustable die that would substitute for several individual dies. Because of the difficulties involved in accurately spacing both punches and dies, holding them in place securely, and changing them when necessary, such dies have in most cases been only moderately successful. The die described in this article overcomes all the objections heretofore advanced against the use of an adjustable die. The different punches and dies are independent, no packing pieces are used, and any number of slots up to twenty may be punched at once and the die changed without removing it from the press.

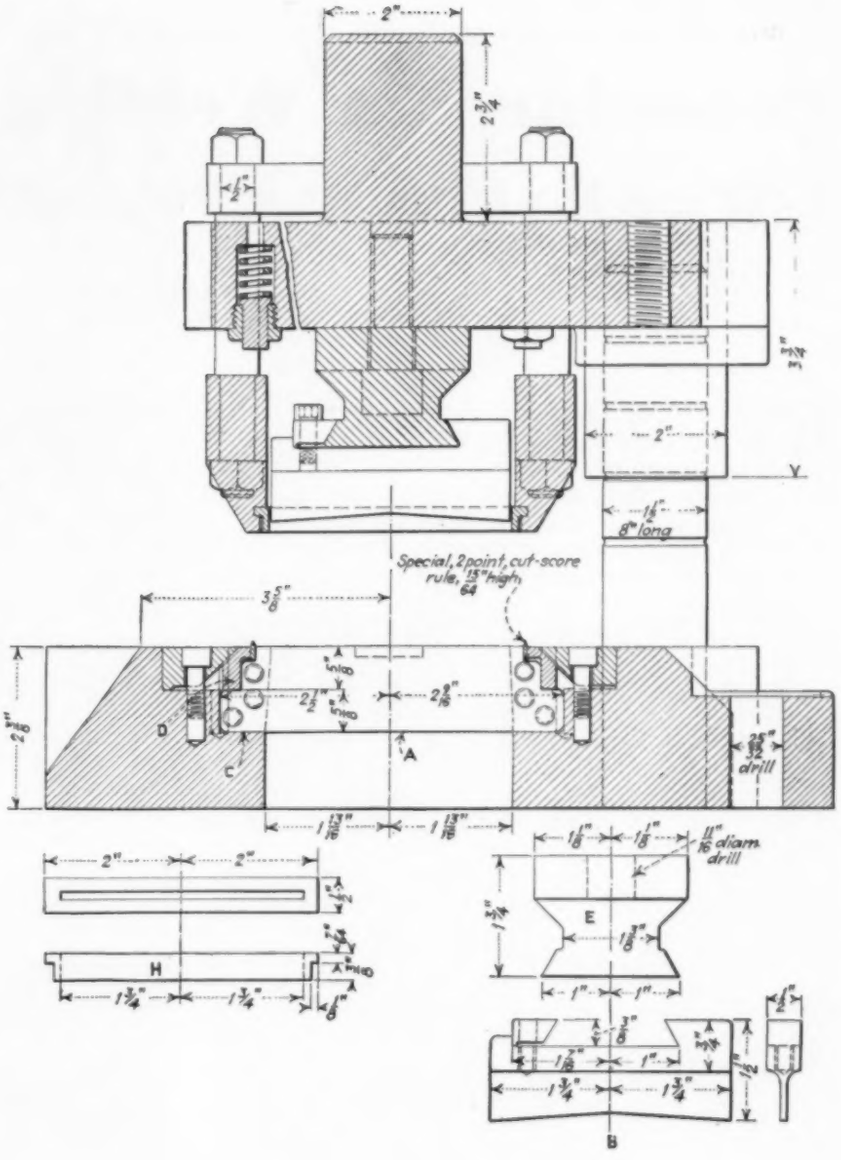
This particular die was designed for Adartcraft, Inc., and is employed for punching paper board 0.060 in. thick, but is equally applicable for punching metal. The design presents a number of uncommon and well-considered features. There are twenty die blocks *A* and an equal number of punches *B*, all of which are arranged for adjustable spacing, as the blocks themselves are only ½ in. wide and have the slot in the center. ½ in. is the minimum spacing between centers. The number of slots in any given piece can be changed as desired and the spacing can be varied accordingly.

Since no standard die set met the required conditions, a special two-pillar set was designed. Neither three nor four pillars could be employed without interfering with the feeding of the stock and with the stops for positioning it. The die shoe is recessed, being provided with a ledge to support the die blocks, each of which is made up from two pieces of flat tool steel and a spacer. These are hardened, ground and riveted together with three rivets at each end.

Die blocks are clamped against the ledge *C* at each end by a simple L-section bar *D* mating with a bar wedge having a 45-deg. clamping surface. The bar wedges are each clamped securely by 21 fillister-head screws having hex-recesses for a wrench. On its lower surface each bar wedge has a fulcrum projection, about which it tends to turn when the screws are tightened. This tightening not only clamps the die blocks securely but also fastens the scoring rule that runs at right angles to them in its correct relative position. With this arrangement there is no need for spacer blocks or other fastening of the die blocks in a horizontal direction at right angles to the slots, yet they can be shifted easily when a different spacing or number is required.

Except for the scoring rules *N* which project very slightly above the level of the die blocks, the top surface of the whole assembly in the die shoe is flat, which of course makes grinding a simple matter when it is required and also facilitates feeding of blanks into the die.

Of equal importance to the adjustable arrangement and secure fastening of the individual die blocks is the corresponding attachment of the punches which mate with them. These punches are not left soft, as is often the case, but are hardened and ground. Grinding is done not only on the blade of the punch, but also on the surfaces which match with the punch bar *E* that carries them. As the drawing shows, the punches are dovetailed to fit the punch bar which in turn is doweled and fastened by bolts to the punch holder. The latter is ex-



The individual blades and slots of this multiple slotting die are adjusted and clamped without the use of fillers or packing pieces

tended to the rear and bushed to fit the pillars that guide it in reference to the die.

Punches are fastened securely to the punch bar by beveled clamps that fit the dovetail and the punch in the manner shown. Each clamp is drilled with a clearance hole to receive a ¼-in. fillister-head screw which is tapped into the body of the punch and which, when tightened, wedges against the punch bar and also draws the punch tightly against it.

Stripper bars *H* are carried on bolts attached to the cross pieces provided for this purpose above the punch holder in which the bolts slide. These bars also serve to force the blank downward against the score rule *N*, causing the latter to cut about half way through the blank. As the press closes, the stripper bars are forced against the spring-seated plungers shown, further motion serving to compress the springs which afterward perform the stripping operation. The limiting motion of the stripper bars is controlled by shims on their upper surface and by the consequent pressure of the springs above the plungers. Hence the seating is not positive but is adjusted to produce the desired scoring effect. This arrangement also provides the necessary flexibility to avoid injury in case two blanks are fed instead of a single one.

Production with this set of dies has now been proceeding for several months. When attached to a tilted press equipped with automatic feed and running at 100 r.p.m. it turns out about 30,000 pieces a day and already has slotted over 500,000 pieces without regrinding of the dies. These are still in excellent condition, despite their use on paper, which is ordinarily rather hard on dies.

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Ambridge Test of Paints for Water Tanks

PITTSBURGH Des Moines Steel Co. and the Borough of Ambridge, Pa., who are jointly conducting an extensive test of paints for the interiors of water tanks, have announced the results of the fifth inspection of the 196 paint panels made Feb. 15, after 130 days exposure. Following are the average ratings for various groups of paints into which the panels have been classified:

Classification	Average Rating For Class Per Cent
Red Lead and Linseed Oil Paints	89.7
Other Linseed Oil Paints	67.0
Synthetic Gum Vehicle Paints	74.0
Pyroxolin Base Paints	60.0
Gilsonite Asphalt Paints	64.3
Coal Tar Paints	82.1
Asphalt Emulsions (Plain)	86.0
Hot Bituminous Coatings	98.9
Thick Plastic Coatings	85.2
Elaterite Paints	82.2
Clear Varnish Paints	82.8
Aluminum Paints	88.0
Miscellaneous Cold Bituminous Paints	71.3
Asphalt Emulsion and Filler	74.0
	Per Cent
Average Rating of Classified Panels	78.4
Average Rating of Unclassified Panels	72.5
Average Rating of All Panels	76.3

The next inspection will be held March 15. Previous results appeared in *AM*, Vol. 75, page 895 and Vol. 76, page 237.

Procedure for Welding Large Everdur Pressure Vessels

CHARLES B. JACOBS
American Brass Company

EVERDUR, as a tank material, was first adapted to small domestic sized tanks, either automatically all-welded of hot-rolled sheet or fabricated from a cold-drawn seamless shell with a pressed-out bottom welded in. Recently, however, the material has been used for vessels of large capacity, ranging in size from 500 to 20,000 gal. and constructed by various methods, including riveting and metal arc and gas welding.

Whitlock Coil Pipe Co., Hartford, Conn., has lately constructed and installed two Everdur accumulators of 10,000 gal. each to serve as units in the "Unatherm System" for process hot water in the plant of the Berkshire Knitting Mills, Wyomissing, Pa. These tanks were metal arc welded, and as each step in the welding technique was carefully worked out and tested, a description of their construction gives a successful procedure for working with the material.

Hot-rolled Everdur plate has a tensile strength of from 55,000 to 65,000 lb. per sq.in., depending on the thickness of the plate, and a yield point of from 27,500 to 32,500 lb. The design of the accumulators called for vessels 9 ft. in diam. and 22 ft. long. Since the metal required no additional thickness for corrosion, shells of $\frac{1}{2}$-in. metal, and dished and flanged heads of 0.65-in. and 0.75-in. metal, provided ample factors of safety.

Fabrication in all preliminary operations—shearing, scarfing and rolling—was the same as though it had been ordinary low-carbon steel plate.

Preliminary Trials Advisable

In welding Everdur, a definite setting of welding apparatus for any job can best be determined by a short preliminary trial under the exact conditions to be used in the set-up. This procedure was followed in the case of the accumulators. General principles to be followed in welding the material worked out as follows:

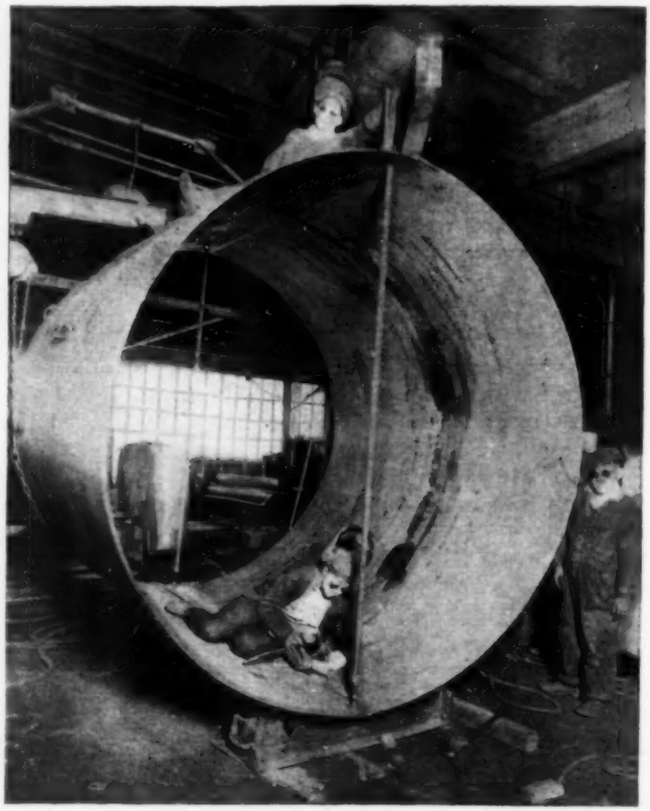
Everdur should be welded as rapidly as possible. The reason for this is that it is desirable to keep the shrinkage stresses in the red-hot metal as low as possible, and, of course, the best way to avoid them is to cut the heat flow into the base metal as short as is consistent with good union. This rule holds whether the welding be done with oxy-acetylene torch or the electric arc. Moreover, the most homogeneous solution the metal can have is that of its liquid state. Hence, the quicker the metal is solidfied, the more uniform will be the cold metal and the finer its structure.

Where maximum strength and ductility in the weld are desired, steps must be taken to eliminate locked-up stress and to restore the structure to one similar to that of the rolled sheet. Some form of cold work, such as rolling or peening, following by an anneal, will be found desirable. This applies more particularly to welds in thick sheets. For thin sheets $\frac{3}{16}$ in. and under, the cooling from welding temperature is so extremely rapid as to give excellent strength and ductility in the weld metal. Moreover, the reinforcement is usually a higher per cent of the original thickness in thin sheets than it is in thick sheets.

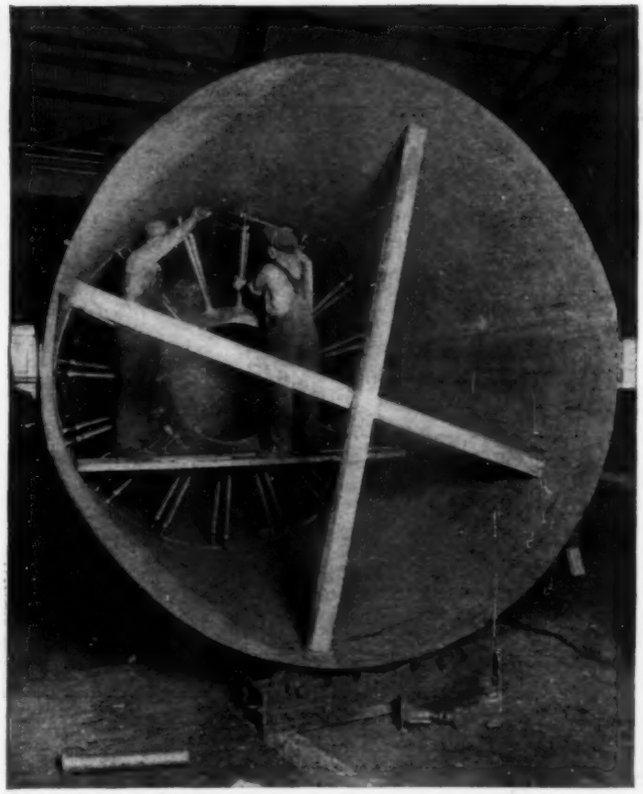
Two Courses—Two Plates

The accumulators were welded in two courses, each course containing two plates. Exclusive of the welding of the fittings, there were 125 lineal feet of welding on each tank. Everdur electrodes of $\frac{5}{32}$ in. were used with 190 amp. and an arc voltage of approximately 28. The longitudinal seams were welded in three passes. Seams were of a double V-type, and the plates were scarfed so that the opening on the outside was twice that of the one on the inside.

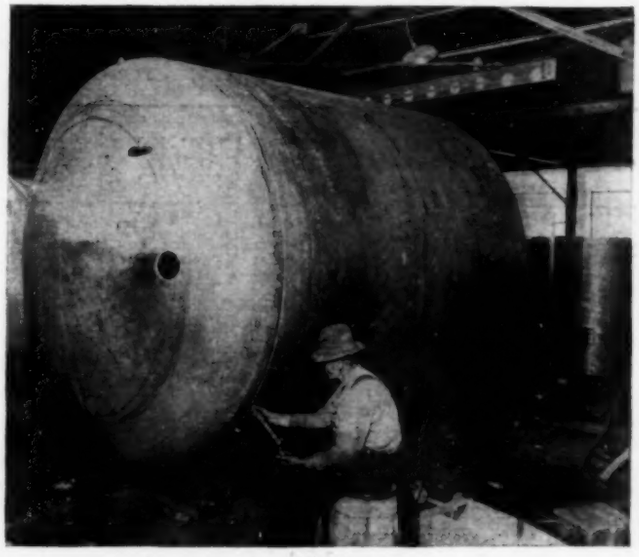
The arc between the Everdur rod and plate is most effective with the electrode positive. There is no appar-



Arc-welding an inside longitudinal seam with Everdur rod



Assembling the two courses and placing the cartwheel jacks



Peening the first bead on the girth seam

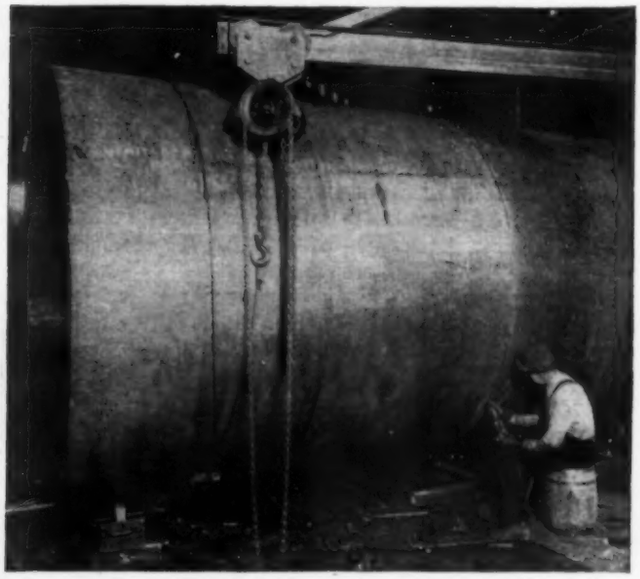
ent crater—to the welder used to welding steel, it would seem that no penetration is taking place. Since the molten metal in the Everdur arc is more fluid than in the steel arc, it is essential that the seam or joint be backed with a bar or plate, preferably of copper.

A Typical Dendritic Structure

Everdur welds show a typical dendritic structure which can be broken down and recrystalized by a combination of cold-working and annealing. In the case of these two tanks, the beads were cold-worked by hammering with an air hammer, and the anneal for the initial beads was effected by the heat of the welding of the next bead. Final beads were annealed with an oxy-acetylene torch at a temperature of approximately 650 deg. C. After a little experience, the welder can estimate the temperature of the anneal by the dull red color. The temperature can be accurately determined by the use of iron-constantan thermocouple, welded to the bottom of the plate, until the welder learns to gage it by color. Where a seam runs to an edge, the annealing should start at an inside point and finish at the edge. If started at the edge a crack may result from tension as the torch is moved inward.

The girth seams, both at the heads and in the middle, were welded in a single V, using four passes, three on the outside and one on the inside. Each bead was slightly less than $\frac{1}{4}$ in. in thickness. A cartwheel jack was used to hold the course in a true circle in setting up girth seams.

As the peening showed its effect only through about $\frac{1}{4}$ in. of the weld, each bead was peened separately. In making the longitudinal seams, the first two layers were peened simultaneously, with a tool working on each side of the seam. Layers one and two were hammered with



Peening the final bead on the girth seams with a pneumatic hammer

Welding fittings on the tank heads

flat smooth tools, and layer three with a round convex tool. The same hammering procedure was followed with the girth seams except that the layer inside was hammered with a concave tool which straddled the weld and brought it down all at once. Openings in the heads and the shell for pipe connections were cut out by drilling and finishing with an air chisel. The connections were welded both inside and outside by means of a single bead run around them, each layer of these beads being hammered with a smooth, flat tool. Annealing was done with a gas torch.

Strength

Test samples showed that the welded seams, with the reinforcement bead machined flush, had a tensile strength of from 85 to 90 per cent of the parent metal. With the reinforcement head left on, the welds had a strength equal to or slightly in excess of that of the plate.

The time for actually depositing metal is much less for Everdur than for steel. However, the time required for refining the welds brings the operating time up somewhat in excess of that for a similar weld in steel.

While the usual test pressure for vessels of the type of the accumulators is 1½ times working pressure, these tanks were tested to 200 lb. per sq.in. hydrostatic pressure, more than double the working pressure. Initial application of the 200-lb. pressure, which develops a stress in the shell of 21,600 lb. per sq.in., resulted in an increase in the circumference of the tanks of slightly more than ⅛ in. This also raised, permanently, the yield point of the plates, but the tensile strength was unaffected. After the initial pressure of 200 lb. was reached, there was no further expansion in the circumference of the tanks. The accumulators were given a 24-hr. test at 200 lb. With the pump shut down and the valves closed, there was no drop in pressure, showing that the shells were carrying the load with no change in shape. This 24-hr. test was repeated with the same results.

Annealing the final girth seam bead with torch

Assembling head and shell with the metallic arc

• NEXT WEEK •

Several weeks ago one of our good friends wrote us, stating that he was right up against the problem of whether to centralize his tool grinding or not. He had heard this, that and the other thing about practice in other plants, and he hoped to get some positive data.

Since practice changes rapidly these days, there was only one thing to do—to write other good friends and get the low-down. The replies were so much to the point that we wrote back again, asking permission to publish. And the leading article next week is the result. You can look forward to a broad-gage symposium of grinding practice.

Unless something unforeseen occurs, there will be found in the same issue: data on a new method of comparing and selecting belts; press tools for manufacturing covered coil stands; refrigeration for expansion fits; designing long and short addendum gears; wear limits of locomotives; rating employees in the shops of a prominent automobile builder.

• IN A. M. •

NEW BOOKS

DING GOES TO RUSSIA—*By Jay N. (Ding) Darling. 195 pages, 6x9 in. 65 drawings by the author. Clothboard covers. Published by Whittlesey House, a division of McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y.. Price $2.50.*

Whoever would have thought of sending a cartoonist to view the most serious experiment of modern times? Apparently no one did; for Ding, shrewd political cartoonist, went himself. His observations are not only worth recording, but worth reading. Too many American investigators have failed to see Russia entire. Here is a man whose life's work has been devoted to picturing in a few lines an entire economic condition, a complete political event, a background that has stood him in good stead in describing the life of a nation many times larger than our own.

His book is a simple, concise, pungent, straightforward, intensely human account of a country not nearly so Red as it is painted. And what are his conclusions? Here's a hint from his preface: "Russia, in my judgment, is serving a most valuable common purpose in becoming a great laboratory in which all of the vagabond socialistic and economic vagaries of the age are being tried out in actual experiment. Fortunately, we are far enough away to be safe from all except the tremors of explosions which may result, and yet close enough to profit by any important discoveries that may prove successful."

ANNUAL REPORT OF THE SMITHSONIAN INSTITUTION, 1930—*650 pages, 6x9 in. Cloth boards. 340 illustrations. Indexed. Published by the U. S. Government Printing Office, Washington, D. C. For sale by the Superintendent of Documents. Price $2.00.*

Besides being the annual report of the regents on the operations, receipts and expenditures of the institution for the year ending June 30, 1930, the book contains a large amount of matter contributed by eminent scientists, as well as some historical matter. The subjects cover a wide range: Beyond the Red in the Spectrum, H. D. Babcock; Growth in Our Knowledge of the Sun, Charles E. St. John; The Modern Sun Cult, J. W. Sturmer; The Moon and Radioactivity, V. S. Forbes; Modern Concepts in Physics and Their Relation to Chemistry, Irving Langmuir; Waves and Corpuscles in Modern Physics, Louis de Broglie; New Researches on the Effect of Light Waves on the Growth of Plants, F. S. Brackett and Earl S. Johnston; The Autogiro: Its Characteristics and Accomplishments, Harold F. Pitcairn; Ten Year's Gliding and Soaring in Germany, Prof. Walter Georgii; The First Rains and Their Geological Significance, Assar Hadding; Weather and Glaciation, Chester A. Reeds; Wild Life Protection —An Urgent Problem, Ernest P. Walker; The Nesting Habits of Wagler's Oropendola on Barro Colorado Island, Frank M. Chapman; The Rise of Applied Entomology in the United States, L. O. Howard; Man and Insects, L. O. Howard; The Use of Fish Poisons in South America, Ellsworth P. Killip and Albert C. Smith; A Rare Parasitic Food Plant of the Southwest, Frank A. Thackery and M. French Gilman; The Mechanism of Organic Evolution, Charles R. Davenport; Extra Chromosomes, a Source of Variations in the Jimson Weed, Albert F. Blakeslee; The Age of the Human Race in the Light of Geology, Stephen Richarz, S. V. D.; Elements of the Culture of the Circumpolar Zone, W. G. Bogoras; The Tell En-Nasbeth Excavations of 1929—A Preliminary Report, William Frederic Bade; Recent Progress in the Field of Old World Prehistory, George Grant MacCurdy; Ancient Seating Furniture in the Collections of the United States National Museum, Walter Hough; Aspects of Aboriginal Decorative Art in America, Based on Specimens in the United States National Museum, Herbert W. Krieger; The Acclimatization of the White Race in the Tropics, Robert De C. Ward; The Eighth Wonder: The Holland Vehicular Tunnel, Carl C. Gray and H. F. Hagen.

PROCEEDINGS OF THE THIRTY-FOURTH ANNUAL MEETING—*Issued by the American Society for Testing Materials. Part I, 1,119 pages, and Part II, 1,027 pages, 9x6 in. Clothboard cover. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa. Price, each part $5.50, paper binding; $6.00 cloth binding; $7.00 half-leather.*

Part I contains the reports covering the work of 42 standing and research committees and one joint committee and two sectional committees on ferrous metals, non-ferrous metals, and non-metallic materials. In addition to the 74 tentative standards given, and several tentative revisions in standards, there are other reports on methods of testing, metallography, nomenclature, and definitions. This first part also contains the president's annual address and the executive committee's report.

Part II contains the technical papers that were given at the annual meeting of the Society. The subjects include fatigue, endurance testing, magnetic analysis, damping capacity, corrosion of metals, a symposium on malleable iron castings comprising 118 pages of authoritative critical data, a symposium on the abrasion testing of rubber, covering 60 pages, and a paper on the economic significance of specifications for materials. There are also many papers on structural and building materials and color pigments.

STANDARD HANDBOOK OF STEEL PRICE EXTRAS (Third Edition)—*Edited by Walter S. Doxey, Editor,* Daily Metal Trade. *128 pages, 5½x7¾ in. Indexed. Paper covers. Published semi-annually by* Daily Metal Trade, *Penton Publishing Co., Penton Bldg., Cleveland, Ohio. Price $1.00.*

New sheet steel extras, a section covering chrome-nickel steels, and product data pages showing products and size ranges of leading steel producers are incorporated in the semi-annual revision of this standard handbook. Issued in pocket size, the booklet embraces all commonly used tables of steel price extras, replacing the hundreds of odd-size booklets and folders issued by individual manufacturers. It is complete from Alloy Steel to Wire and should prove of value to many.

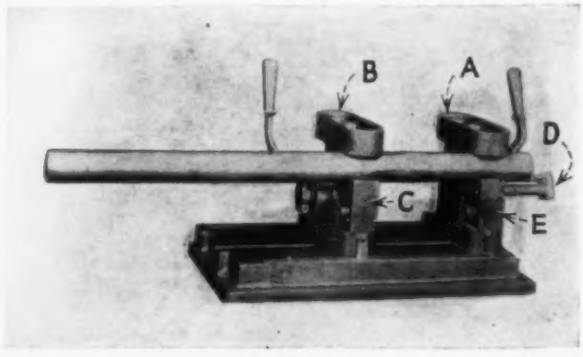
IDEAS FROM PRACTICAL MEN

Jig for Drilling Holes in Shafts

C. B. COLE
President, Tool Equipment Sales Company

SHAFTS of various diameters that are to have holes drilled near both ends generally require individual jigs, particularly if the center distances are different. Also, the number of holes that are to be drilled at one time is another point to be considered. When the quantity is in fair-sized lots, it is expensive to lay out the holes and drill them with the work resting in V-blocks. This is a slow operation, and it is hard to maintain accuracy or to drill holes that are central with the axes of the shafts, unless a means can be provided for a drill bushing to be brought sufficiently close to the work to guide the drill properly.

A manufacturer of road equipment was confronted with the problem of drilling holes near both ends of a



lot of shafts varying in diameter from $1\frac{1}{4}$ to $3\frac{3}{8}$ in. The center distances of the holes were from 3 to 18 in. and their diameters varied from $\frac{1}{4}$ to $\frac{3}{8}$ in. To make individual jigs for these various shafts would be entirely too expensive. Other known methods would be too slow. Since the shafts came through in lots of twelve or more, some faster method had to be devised.

The writer was asked for suggestions as to how the problem could be solved in order to give the maximum production with the lowest possible tool cost. When I made an analysis of the job, it was evident that some means would have to be provided for drilling the shafts easily and cheaply. This required a jig that was adjustable and as universal as was possible. After giving the matter some thought, I sent a sketch outlining the idea of a jig to a tool shop that was able to develop a design that would meet the requirements. Therefore, a blueprint showing the finished design was submitted, and a price was quoted. As the price was very attractive, the concern in question ordered one of the jigs and it is now in successful operation.

The jig, shown in the illustration, consists of a cast-iron base having two T-slots milled in it and two single-post jigs. The jig *A* is mounted on the base in a fixed position. The jig *B* is movable and is located on the base by keys attached to the bottom of jig *A*. Bolts are provided for clamping it in the required position, which is determined by an 18-in. scale attached to the front of the base. An indicator line is milled on jig *B* to coincide with the divisions on the scale. The V-blocks *C* are removable. At *D* is an adjustable stop for locating the shafts in the correct position endwise. The top plates carry master bushings for the various sizes of slip bushings that are necessary. They are also fitted with rest pins underneath to bear upon the shafts and hold them in position. The clamping levers are offset to prevent interference.

A shaft is shown in the jig ready for drilling. This design enables the manufacturer to drill over 100 different sizes of shafts with the one jig. The saving in tool expense is very great and the quick-acting features of the jig reduced production costs to an extremely low figure.

Contour Machining in the Shaper

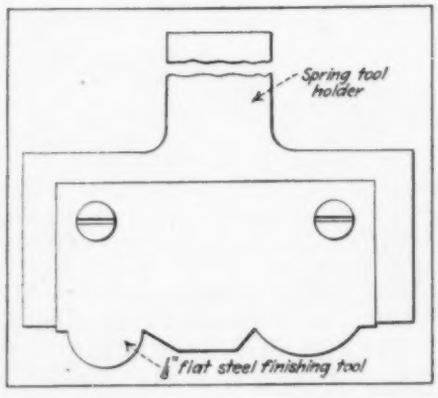
Discussion

CHARLES KUGLER

The article by J. T. Towlson under the title given above (*AM*—Vol. 75, page 674) discussing an article by Dannel I. Krauss (Vol. 75, page 28) interested me. In my opinion, the methods advocated by both authors are right. The reason why they differ is because the required accuracy varies in different shops.

The method described by Mr. Krauss is the cheaper, since it eliminates the finishing tool. If he had used a flat scriber instead of a round one, the line would not have been several thousandths from the templet, as stated by M. Towlson.

In all of the shops in which I have worked time has been a factor, and the slogan has been: Do the work well enough for the job. I once worked in a shop making plumbing supplies, where the method of making contour tools was cheaper than by finish filing. While the shop had a filing machine, it was too small to admit the shanks of the tools. The work was therefore roughed out in the shaper to a scribed line and then finished with a contour tool such as is shown in the accompanying illustration.



A piece of $\frac{1}{8}$-in. flat steel was sawed and then filed in the filing machine, after which it was fastened to a piece of flat cold-rolled steel. It was then hardened, eliminating warping and cracking to a great degree. The tool was then set in the spring holder shown. This method was used on account of its cheapness, not because accuracy was desired.

It may be that Mr. Towlson finished his tool by contour grinding after it was hardened, but I know that such a refined and costly method is not always necessary.

In one large plant where I was employed, it was the practice to grind all circular forming tools on the contour after hardening. Under a new manager, this costly method was eliminated and the tools were simply polished with abrasive cloth.

Pipe Bends by Cutting and Welding

Discussion

A. EYLES
Foreman, Sheet Metal Department,
London, Midland & Scottish Railway Works
Manchester, England

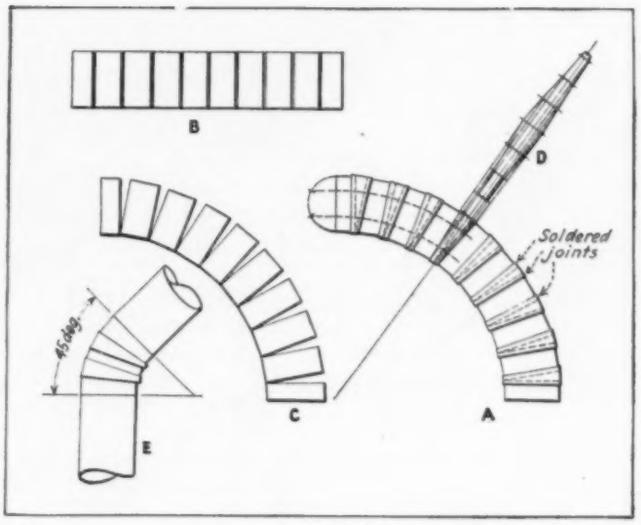
Having read with interest the articles under the title given above by Henry C. Francis and Walter R. Parkinson (*AM*—Vol. 75, pages 181 and 465, respectively), and having had considerable experience in making welded bends from sheet metal pipe; I would like to add a few further notes on the subject.

In the first place, I entirely disagree with Mr. Parkinson's statement, "I would suggest that such bends in piping of any description, unless for a temporary job, are decidedly unsuitable." Because it is common practice in large engineering works and factories, today, to make welded pipe-bends for various purposes, such as ducts for ventilating fans, dust exhaust and conveying systems, but certainly not for high-pressure steam pipes, why are steam pipes referred to in Mr. Parkinson's article when there is no mention regarding steam in Mr. Francis' article?

It has often been my experience to be called upon to make ventilating or dust-collecting ducts that require riveted, soldered, or welded bends. other than the standard form that may be bought in the open market. There are several methods of making bends in addition to those for producing them by machinery. The method generally adopted for bends for dust-collecting systems consists of laying out a development of the bend. The different segments are then cut from this development, sufficient allowance being made for joining when riveted or soldered joints are employed. These methods are adequately treated in many textbooks on sheet-metal drafting.

In the majority of engineering shops, however, such books are not always available when they are needed, and many a mechanic has been at a loss to know how to proceed to lay out a platform for a pipe bend of the angle and radius desired. It is for the use of such mechanics that the articles by Mr. Francis and myself have been prepared, illustrating simple methods of making pipe bends (either single or double, and of any radius) from sheet metal pipes, without the necessity of laying out the developments to obtain the patterns.

A complete right-angle bend is shown at *A* in the accompanying illustration. In starting to make a bend



of this type, the pipe is marked at the point corresponding to the center of the bend. Equal distances are then marked on each side of this point, so that a total of nine marks has been made over the section of the pipe to be bent. These marks are drawn almost all the way around the pipe.

A hacksaw or a sharp chisel is then used to cut along these lines, care being taken not to cut entirely around the pipe, but to leave small portions to hold it together at the inner side of the board. The method of procedure will be readily understood by referring to the diagram *B*. The pipe is then bent to the form shown at *C*, and the openings are closed by pieces of sheet metal of the shape shown at *D*. Sufficient allowance is made in the size of these pieces so that they will lap over both sides of the openings to allow for soldering them in place. After the pieces have been cut out, they are slightly hollowed or peened by hammering them on a concave block. After the peening operation, the pieces are bent around the pipe and secured in place, thus forming the complete bend, as shown at *A* in the illustration.

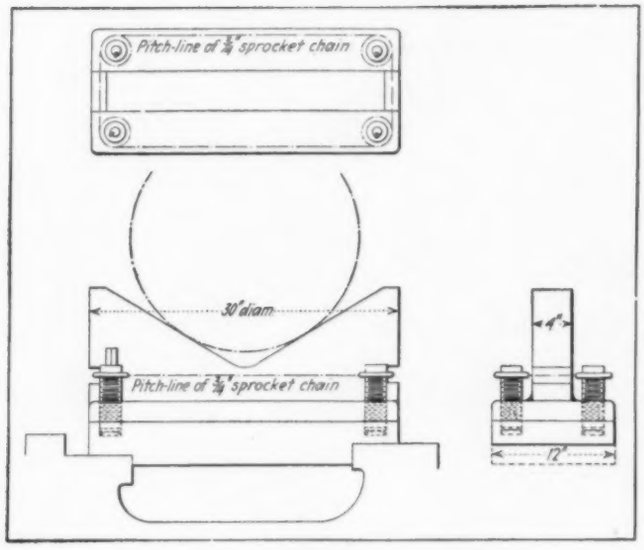
Bends of obtuse and acute angles and reverse bends are made in the same way. An obtuse angle bend is shown at *E*, where it will be evident that the construction is exactly the same as previously described, except that fewer cuts have been made in the pipe. Reverse bends are made in the same way, except that the cuts for opposite directions of bend are made on opposite sides. An ordinary mechanic will be able to make satisfactory bends by this method without having had any extensive experience in sheet metal work.

V-Blocks for Taper Work—*Discussion*

J. P. HARBESON, JR.
Designing Engineer, Camden Forge Company

In the V-blocks described by D. Q. Dunstone (*AM*—Vol. 75, page 606), one of them must be raised by blocking.

Since we have much tapered work to be set up for machining, we made a set of V-blocks to take work from 4 to 30 in. in diameter, one of which is shown in the illustration. This V-block is mounted on a base from which it is raised by four 2-in. elevating screws. The screws have small sprockets keyed to their heads, all being



connected by a driving chain. One screw has a squared head for a key wrench, so that by turning it all the other screws are turned in unison.

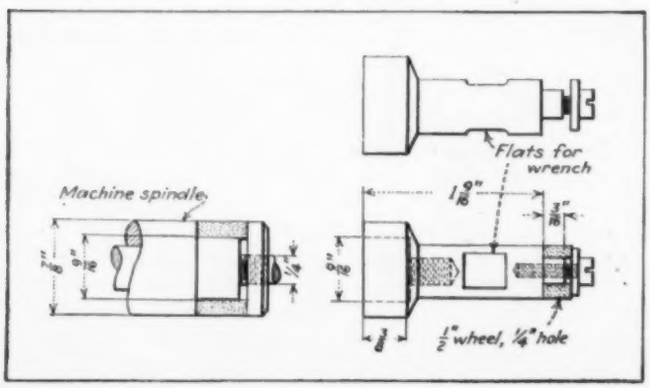
The lower ends of the screws rest on step washers of nitrided steel, the lower ones of which are crowned on their upper sides.

Adapter for a Grinding-Machine Spindle

R. A. DRESSLER

Recently, we had to grind some ¾-in. holes in a lot of disks of rather large diameter. Two machines were available for the job. The spindle of the larger machine, shown at the left in the illustration, was too big to take the small wheels necessary, and the chucking capacity of the smaller machine was not great enough for holding the disks. So we were forced to use the larger machine. Since there was only an occasional job of this kind, and it was not deemed advisable to make an entirely new and smaller spindle to carry the small wheels necessary, we made the adapter shown with the wheel in place at the right.

The adapter was tapped to fit the threaded end of the spindle and was counterbored to fit snugly on the wheel seat. Flats were provided for a wrench for assembling the adapter to the spindle. The over-all length of the adapter is but 1¾ in., so that its overhang is not sufficient to affect the stiffness. The device has been in successful use for a long time.

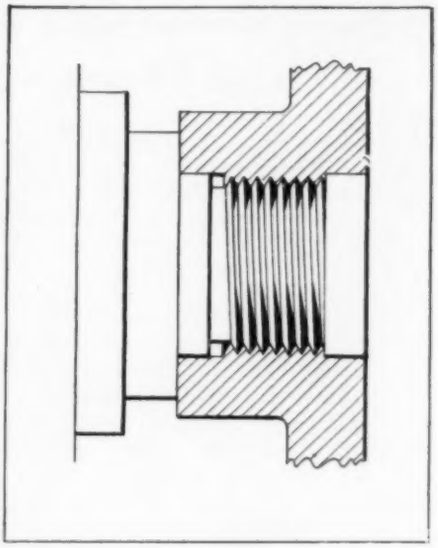


Piloting Fixtures on Faceplates

Discussion

FRANCIS W. SHAW
Tool and Gear Consultant
Heywood, Lancashire, England

Why lathe faceplates are not provided with shallow recesses for the reception of the pilots of fixtures as a matter of course, as suggested by James McIntosh in an article under the title given above (*AM*—Vol. 75, page 788), is a puzzle to me. But why the recesses should be made uniformly ¼ in. deep, as Mr. McIntosh says, is equally puzzlesome. My own practice, not only in shop machines but in lathes made for sale, was to vary the distance from the end of the spindle nose to the face of the faceplate from ⅜ in. in lathes of 10-in. swing to about 1¼ in. in lathes of 20-in. swing.



The recesses were bored out to the nearest standard diameter above the thread size right down to the spindle nose. So were cut away those threads into which chips might fall, and when the faceplate was removed, creep into the thread.

Since the plain part of the spindle just below the shoulder was slightly larger than the nominal thread diameter to permit the threads at the end of the hub to be cleaned out, the faceplate could be screwed on the spindle back-to-fore. Thus, if the end of the hub became damaged, it could be trued up parallel with the front face. The accompanying sketch illustrates the described feature.

Grinding Raw Material on the Centerless

A. E. FRISTEDT
Bolender Works, Stockholm, Sweden

In the manufacture of woodworking machines we have had trouble in using cold-rolled shafts. In the first place, cold-rolled bars are somewhat below the nominal diameters in size, and ofter they vary so that interchangeable fits are impossible. In trying to improve the quality of the machines, we rough-turned bars of a larger size and put them through the centerless grinder. This worked very well.

One day it came to my mind to try to grind hot-rolled bars without previously turning them. The result was so discouraging that we abandoned the process quickly. The main trouble was that the hot-rolled bars were not round, some of them being out of round as much as 1/32 in. When the larger diameter came into contact with the feed wheel, the bar turned about 90 deg. and there it

stopped until it was turned by hand so that the feed wheel would again turn it. Perhaps it is needless to say that the bars were straightened before they went to the grinder. The finished shafts were from 25 to 55 mm. in diameter and 1.25 m. in length.

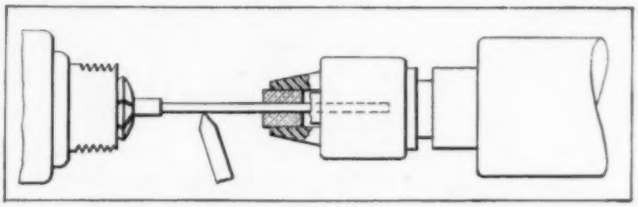
Turning Slender Work

F. E. FICK

Lately, I was given the job of turning several pieces of tool steel to 0.100 in. in diameter, plus or minus 0.001 in. The pieces were to be used for inserted punches and were 4 in. in length. As I was not given any time to make hollow mills or other special tools for the job, I proceeded as follows:

A bronze bushing, $\frac{3}{8}$ in. outside diameter and 0.102 in. inside diameter, was made and held in a drill chuck in the tailstock spindle of the lathe. The drill rod from which the punches were made was held in a draw-in collet and was turned to about 0.102 in. in diameter for a distance of about $\frac{5}{8}$ in. Then the collet was loosened and the drill rod was pulled out a couple of inches, the turned end being engaged in the bronze bushing, having a little lubricating oil put on it.

The bushing acted as an outboard bearing, and after the collet was tightened, I was able to take quite a long



cut between the bushing and the collet without the work springing away from the tool excessively. By turning the work for a couple of inches in length and then pulling it out from the collet a couple of more inches and turning that part, I soon had the punches turned. They were then filed and polished to the final size, using abrasive cloth for the polishing. The sketch shows the set-up.

If the shank of the drill chuck has a hole in it and additional bushings are used as supports at intervals, quite long work can be turned by this method.

SEEN AND HEARD

JOHN R. GODFREY

The Three Shop S's

The three S's formerly associated with shops—smoke, soot, and smudge—bid fair to be dissipated gradually by the trend toward color. But just as important is the necessity of proper maintenance—painting, cleaning, and window washing—in order to preserve the desired results. Said Henry Ford several years ago: "No shop can have morale without cleanliness.

"We tolerate makeshift cleanliness no more than makeshift methods."

At that time Ford had 1,000 cleaners at River Rouge; the number now is close to 5,000. Some Ford windows are washed as often as once a week, 200 brushes and mops are worn out weekly in the Motors Building alone; 1,700 barrels of general cleaner, 800 barrels of soda ash, 70 barrels of soap powder and well over a thousand Ford-made mop pails a month are used. Rubbish cans are emptied every two hours. All floors in every department and in every factory office are scrubbed every eight hours, and many areas adjacent to machines, every two hours. Wider aisles and interior driveways, less subject to oil or litterings from machines or furnaces, are mopped once a day.

This is but a single example, possibly an exaggerated one so far as most machine tool plants are concerned. But it is an indication of the trend. An old-time stunt that works well is that of painting floor corners white. A variation is that of appointing one sweeper "corner man"—to sweep nothing but the ordinarily neglected corners while the other sweepers take care of the rest.

Imprints in Concrete

Ingenuity crops out in all sorts of places. In visiting a shop that specializes in conveying installations the other day, I noticed that the front door step looked different from the ordinary. A little examination showed that the slab was of concrete and that it bore the imprint of sprocket wheels and chains in a rather striking manner. While the concrete was soft enough to take a good impression, someone had pressed a sprocket wheel in each corner and connected them with a power chain of the open link type, making a fairly permanent emblem of the work carried on in the shop. This called to mind a railroad shop in the Southwest where parts of an old locomotive had been imbedded in the concrete at the base of one of the columns. It made a rather attractive way of preserving these mementoes and was of continued interest to the men in the shop.

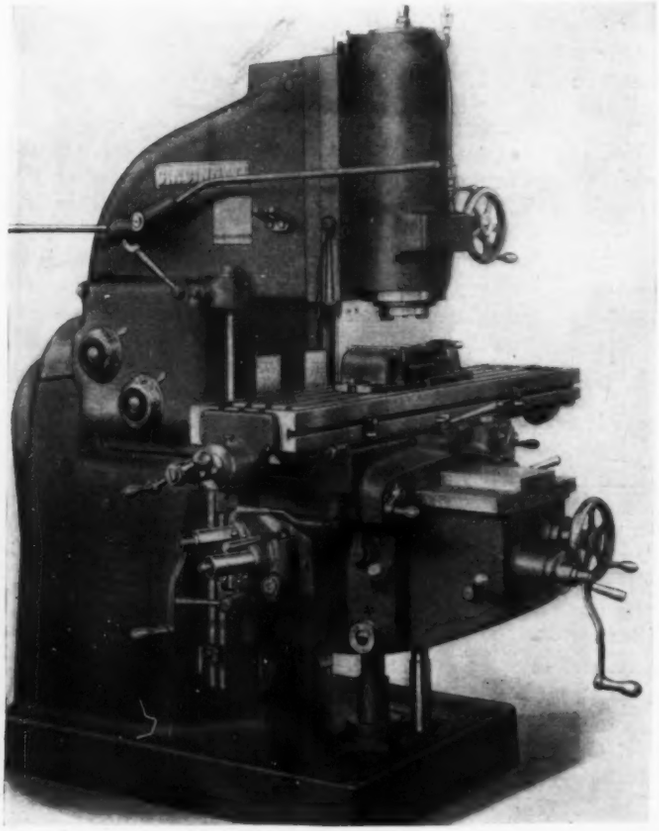
High Gloss Without Polishing

At least one maker of finishing materials is now marketing a fast-drying finish designed for use on sheet metal and making unnecessary the so-called "mist-coat" and polishing operations now so generally required to produce a high gloss on lacquered surfaces. This finish is said to contain the synthetic gum termed rezyl, which is one ingredient of the extremely durable and weather-resistant finishes now quite generally employed. It is especially suited for finishing fenders, splash aprons and similar automobile parts, which since colors have displaced black baking japans to a large extent, are now lacquered and require much time and expense in mist-coating and polishing.

The new finish is sprayed on over primers which have been baked at temperatures of not less than 225 to 250 deg. F and have been sanded smooth. One or two double cross-sprayed coats are applied with 15 min. drying time between coats, and then are air-dryed for 90 min. or force-dryed for 20 min. at 100 deg. F., after which they are either wet-or dry-sanded to remove dust and any minute imperfections. If wet-sanding is done the water must be dryed off before the final operation, which is a 45-min. bake at 250 deg. F. This bake causes the finish to semi-fuse and flow together, removing all scratches resulting from the sanding and leaving a high luster without any polishing.

SHOP EQUIPMENT NEWS

Cincinnati No. 1 Vertical Milling Machine



COMPLETE dual control is featured in the No. 1 vertical milling machine now offered by the Cincinnati Milling Machine Co., Cincinnati, Ohio. It is possible on this milling machine to control completely all movements at both the front and rear operating positions. Independent directional control levers for all three power feeds to table, saddle and knee are provided at both the front and rear. The saddle and knee levers are provided with interlocks to prevent engaging of both feeds at the same time. Each lever acts as an engaging lever as well as a reversing lever. Each one of the above movements has power rapid traverse of 100 in. per min. with the spindle stopped or running. The table is provided with a semi-automatic cycle, which enables the operator to rapid traverse to the cut and automatically trip into feed and then stop at the end of the cut. Rear hand adjusting cranks, including automatic disengaging means, are provided for quickly making accurate cross and vertical hand adjustments with the work and cutters in full view.

Speed and feed changes are made by power from either the front or rear. Sixteen spindle speeds ranging from 20 to 500 r.p.m. and table feeds ranging from ½ to 20 in. per min. are available. Low and high series ranges of feeds are offered as optional. Higher spindle speeds can be supplied at a small extra cost. To change speeds at the front it is only necessary to shift the lever located at the left of the saddle (from rear, shift the lever at the back face of the box carrying the speed and feed dials) to the left with starting lever in stopped position, until the desired speed on the upper colored dial appears opposite the arrow. Engaging the starting lever gives the selected speed. Changing the feed requires the shifting of the same lever in the opposite direction until the desired feed on the lower dial appears opposite the arrow. Feeds can be changed during the cut with the spindle stopped or running. Both the speed and feed dials are easily read.

The vertical spindle is mounted in a head, which is solidly clamped to the frame. Movement of a lever at left side of head, just beneath starting lever, provides for clamping of head. The head is square gibbed and contains both the upper and lower double mounting of the anti-friction bearings for the spindle. The entire spindle drive rolls on anti-friction bearings. Drive for the vertical spindle is taken from the horizontal shaft through a set of spiral bevel gears to obtain smooth drive at high spindle speeds. The hub of the large spiral gear is mounted on a double row of anti-friction bearings that relieve the spindle of lateral strains throughout its length for all positions of the head.

The Vertical Head

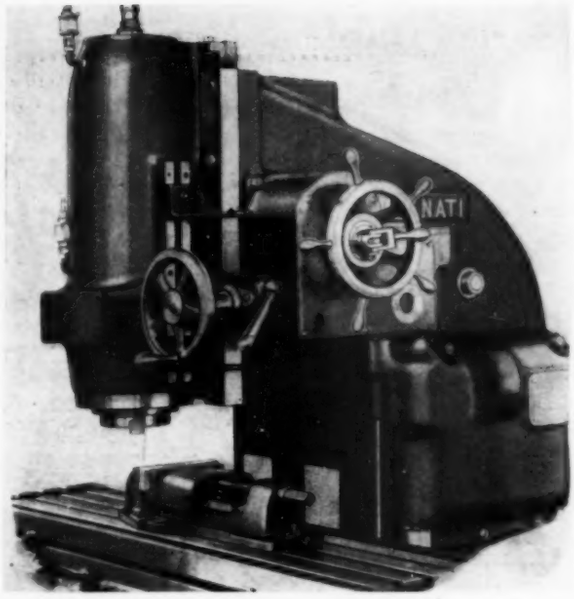
The vertical head is arranged for hand or power feed, the latter at extra cost. Hand movement can be obtained at either a fast rate through the pilot wheel or at a slow rate through a worm and worm wheel. An adjustable stop with micrometer dial is supplied for setting the head.

Power feed to the head with power rapid traverse is obtained by the use of a compact feed mechanism, which takes the place of the hand feed box at the right side of the head. Sixteen power feeds to head are available. Power feed to the head can be engaged in either direction by a single lever, which indicates the direction in which the head will move. Power rapid traverse of the head is obtained by engaging the power feed lever and then shifting the power quick traverse lever for table, saddle and knee movements into the operating position.

The column mechanism, including

entire spindle drive, feed and speed shifting mechanism, is automatically lubricated with filtered oil by a geared pump located inside the column. Automatic lubrication is provided for the knee, while the one-shot pressure lubricating system is used for the saddle and table ways.

The knee incorporates a narrow guide and square gibbing to provide rigid support for the saddle, and to prevent tipping when the table and load are at the extreme position. A cutter-coolant gear pump having a capacity of 8 g.p.m. is supplied as regular equipment.



Power feed to the head with power rapid traverse can be obtained by substituting a compact feed mechanism for the hand feed box

The range of the machine is: longitudinal, 22 in., cross, 12 in., vertical, 15 in., head travel, 6 in. Weight is: belt drive, 6,050 lb., chain motor drive, 6,150 lb. A 3 to 5 hp., 1,750-r.p.m. motor is recommended.

Gray Turret Head Metal Cutter

The W. J. Savage Co., Inc., Knoxville, Tenn., has placed on the market a "Gray" turret-head metal cutter. The turret head of this machine allows the operator to cut shapes in sheets or plates of any design without the necessity of turning the stock through the gap or throat. This feature enables the use of a much smaller throat machine, reduces the necessary floor space, and facilitates cutting the shapes when the sheets are too large to swing through the throat. Where small pieces can be turned, the turret may be locked in eight different positions to accommodate best the handling of stock. The shapes cut are not distorted, but are left flat with clean cut edges that do not require filing.

A second feature is the double-micrometer adjustable strippers. When duplicating parts by master templet, one of the strippers may be adjusted to rest or strip on top of the templet, while the other is resting on the stock, which is on a lower plane than the templet. This prevents the stock and templet from being picked up more on one side than the other, makes stripping even and level, and prevents chatter and breaking of cutters.

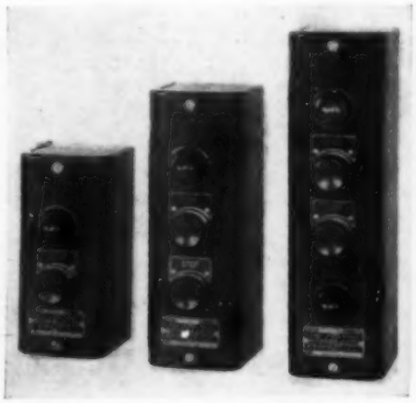
The machine is shown here with a circle-cutting attachment. Rest arms for supporting the stock while cutting are shown at each side of the machine. These arms can swing to any position to support the stock and to such a position as not to interfere with the operator's movements. The ram guide bushing has a micrometer tightening adjustment that insures accurate alignment of the cutters with the die.

The machine is built in several sizes, capable of cutting stock of the thinnest gages and up to 1-in. plate by the nibbling process. In addition, the Gray turret head metal cutter can be quickly converted into a shearing machine for light gages and up to $\frac{1}{8}$-in. stock. A special gag mechanism is furnished to disengage the cutting tool, lifting it high enough over the master templet and stock so that the tool can be entered when making inside cuts.

General Electric Unit-Type Heavy-Duty Pushbutton Stations

Type CR-2940 pushbutton stations have been placed on the market for general industrial applications by the General Electric Co., Schenectady, N. Y. These stations are divided into three general classes: those which make momentary contact; those which maintain the contact, and a combination of both. Momentary contact is required when the station is used with a controller that must provide under-voltage protection. The device consists of one or more of the following units inclosed in a case: pushbutton; selector switch, and indicating-lamp receptacle. Any combination not exceeding five of these units is available in the wall-mounted stations.

The momentary-contact, pushbutton unit provides both a normally open and a normally closed circuit.



The device can be operated on 600-volt circuits. The maintaining-contact selector switches are available for single-pole, single-throw; single-pole, double-throw; or double-pole, single-throw knife switches. In the stations employing indicating lamps 18-volt lamps with color cap are used.

The resistor consists of one or more resistor units and a terminal board mounted in a standard push-button inclosing case. Wallmounted stations have a two-piece inclosing case of heavy punched steel.

Gardner No. 111 Series Duplex Vertical Surface Grinder

Designed to handle single-surface grinding where the work is such that it may be passed beneath two abrasive members, the No. 111 Series duplex vertical surface grinder has been placed on the market by the Gardner Machine Co., Beloit, Wis. The first, or roughing wheel, removes the major portion of the stock, and the second, or finishing wheel, corrects any inaccuracies of the first grinding and produces a finished surface. But one fixturing is required for both the roughing and finishing operations on this machine, and this is its principal advantage. Three sizes constitute the No. 111 line, the work tables being 42, 42 and 72 in. in diam. and the chuck sizes 16 in., 18 in., and 18 or 20 in., respectively.

The horizontal table is supported on flat, circular ways to eliminate spring. This construction also permits a stationary shaft through the center of the table so that fixture-operating mechanisms can be mounted upon it. A large spur gear and pinion drives the table. The fixture body is a unit in itself and can be removed.

The two vertical spindles are mounted on individual columns, and these columns have three-point suspension support. Both can be adjusted from a right angle to a degree which permits a slight tilting, thereby obtaining two cuts on the same wheel in one pass. Tilting of the roughing wheel will produce a very slight concave surface on the piece, but this is removed within close commercial tolerances when the piece passes under the finishing wheel. This procedure is generally followed on very light or thin work to prevent heat distortion from the rapid removal of too much stock at one cut.

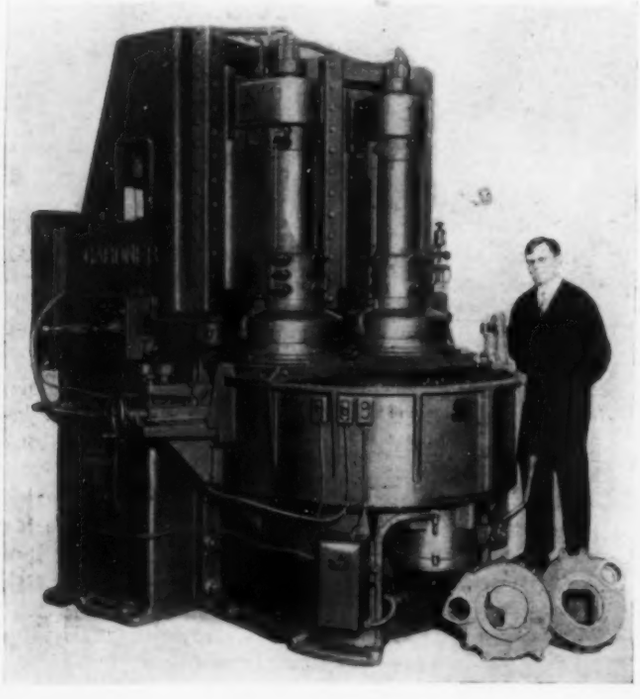
Each column is self-contained, and is equipped with automatic as well as hand means for raising and lowering the spindle to compensate for wheel wear, and to maintain accurate tolerance on the surface to be finished. Inside the column is a ball-bearing-supported screw which connects with the spindle slide. Hinged brackets within the column carry any NEMA frame motor, and these brackets are adjustable to maintain the proper belt tension. By this arrangement, the V-type belts can be removed.

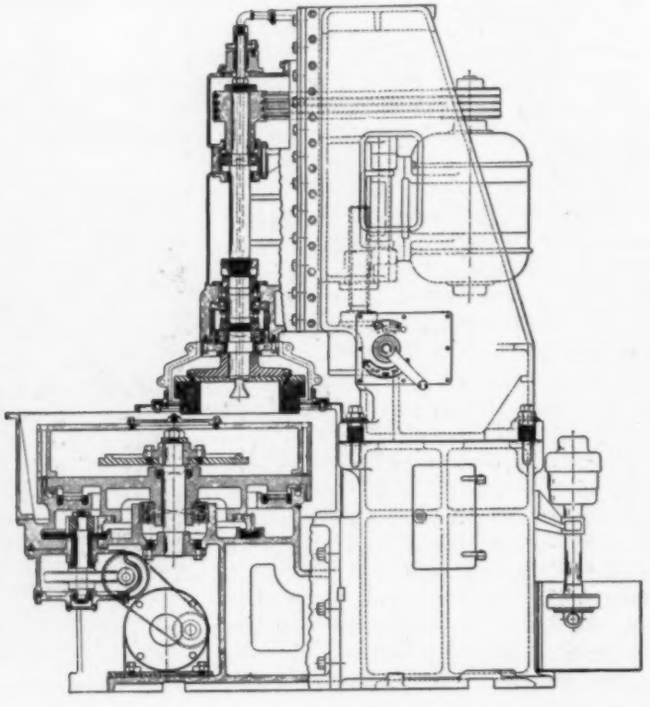
On each side of the base, and directly beneath each spindle, is attached a wheel dresser. Where automatic diamond dressing is necessary, the diamond dresser is mounted on the fixture body, and is controlled by a mechanism inclosed in that body. On the side of the base are two automatic air-operated calipers. When the ground surface passes from the first wheel, it comes in contact with the first caliper. If insufficient stock has been removed on the first pass, the caliper will function and automatically lower the first abrasive member. A second caliper is provided at the finishing wheel and acts in the same manner. These calipers are entirely automatic, and, with the automatic diamond dressing device, the accuracy of the finished work is maintained on practically an automatic basis.

At the rear of the machine is provided space for a removable water tank, which is furnished for wet grinding. The centrifugal pump is adjustably mounted so that the tank can be removed. Up to 50 gal. of water per min. can be supplied to the wheels. In some cases the water is applied through the center of the spindles, and in other cases from underneath them onto the face of the abrasive member. In still other instances, it is delivered from both of these points at the same time.

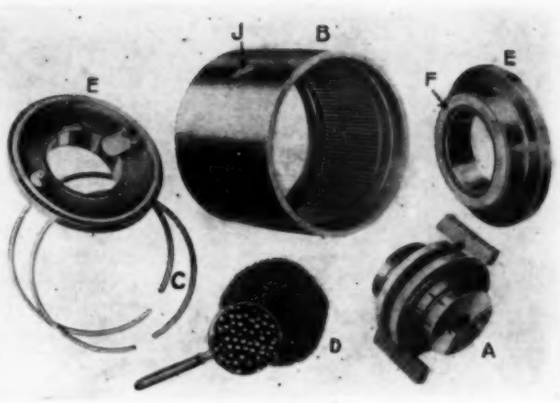
Ramsey-Pulvis Clutch

An automatic starting clutch, which permits the driving motor or other prime mover to come up to speed without load, gives protection against shock, and eliminates the transmission of working strains, is now being offered by the Ramsey Chain Co., Albany, N. Y. This company has exclusive control of the manufacture and sale of the device in the United

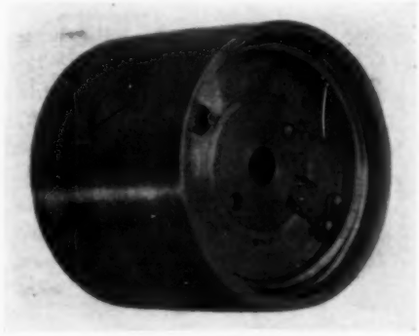




States. The Pulvis principle consists of the gradual transmission of power by centrifugally increasing density of hardened steel shot against driving and driven elements of the clutch. Applications are different than those to which industrial users are accustomed. The clutch can be made as part of the driving member of industrial drives, such as silent



Components of the Ramsey-Pulvis Clutch, and below the assembled clutch



or roller chain, flat belt, multiple V-belt, and all gear types, as well as a coupling on direct-connected drives.

In the photograph showing the parts of the Pulvis clutch, the rotor *A* is a driving member. It is mounted with a key and setscrew on the motor or prime mover shaft. This rotor is in effect a two-bladed paddle wheel. The shell *B* is the driven member, and with the two end plates *E*, it forms a complete closure around the rotor. The end plates are held by the snap rings *C*. The inner surface of the shell is serrated or grooved axially to provide a foothold for the shot. Packing rings *F* seal the housing assembly around the rotor. Steel shot *D* constitute the power transmitting medium between the driving rotor and driven housing. The shot is graphite coated for atmospheric protection and self-lubrication. This shot is introduced in the required quantity through the shell hole sealed with filling plug *J*. The same size of shot is used in all sizes of clutches.

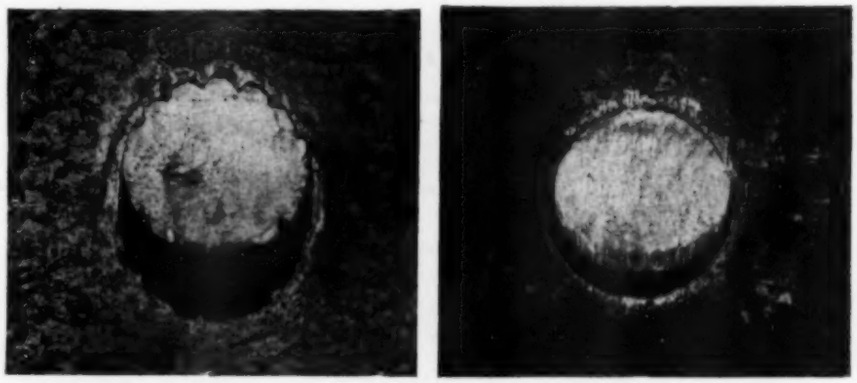
Under centrifugal force, the shot within the clutch piles up in layers on the serrated surface of shell *B*, and piles of the shot also build up against the front of the wings. Having sufficient centrifugal force, the shot assumes the characteristics of a solid mass and effects a metallic connection between the wings and shell to hold the driven and driving elements of the clutch at the same speed. Any capacity up to 400 hp., 200 r.p.m. can be handled by a clutch of the proper size. Bulletin No. 132 describes the device completely.

Dardelet "Rivet Bolts"

Fabrication of machine elements and process equipment with Dardelet "Rivet Bolts" instead of hot-driven rivets can be accomplished more cheaply and joints will be stiffer and stronger in tension and shear, it is claimed. Designed by the Dardelet Threadlock Corp., 120 Broadway, New York, N. Y., they are now in production by its licensees. The over-all cost of fabrication per rivet bolt is said to be approximately one-half the cost of a hot-driven rivet. This figure is arrived at because the rivet bolt need only be tapped into the hole and the nut drawn up, whereas with ordinary rivets it is necessary to heat the rivet and to use more labor in driving. Moreover, the rivet bolt can be used in places which are difficult to get at for riveting.

The rivet bolt is seen to have a standard round head, a splined body approximately $\frac{1}{32}$ in. larger than the drilled rivet hole, and a shank threaded with the standard Dardelet thread to prevent backing off by the nut under severe vibration. In even the largest sizes the device is driven into the hole with not more than a 4-lb. hammer. When the nut is tightened down, the splines resist turning of the bolt, so that more tension can be set up in the shank than will occur with shrinkage of a hot-driven rivet, and so that the parts held together will be under higher static friction to prevent slipping. Moreover, the oversize splines insure equal bearing around the bolt and prevent loosening of the Rivet Bolt in the hole. Other advantages are: the bolt may be made in a steel that has an ultimate strength of 80,000 lb. per sq.in. (higher than rivet steel); higher-strength steels can be used, often heat-treated; and the rivet bolt can be removed quickly and used

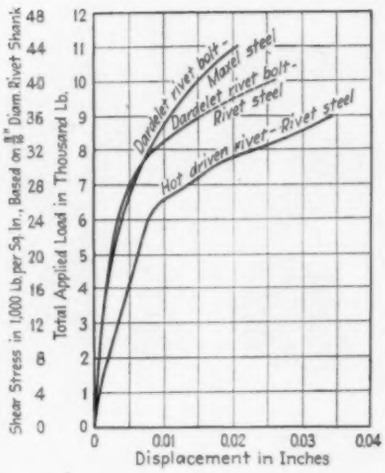
Unretouched photograph of Dardelet "Rivet Bolt"



Left—Unretouched photograph of sheared Dardelet "Rivet Bolt" and of surrounding plate after tension test on a lap joint. Right—View of sheared hot-driven rivet and surrounding plate

again should disassembly of the machine or process equipment be required.

Tests made at Columbia University indicate that lap joints assembled with rivet bolts are stiffer and also stronger in shear and tension than similar joints connected with structural hot-driven rivets. The curves representing the behavior of the rivet bolt connections show no pronounced slip, but rather a gradually increasing rate of displacement with applied load, which may be due either to the high frictional resistance resulting from the tension produced by the nut or to the intimate contact of the splined body with the bolt holes or both. It may be noted that the load-displacement relations are practically the same for the Rivet Bolt connections whether the bolts were made of Maxel steel or structural rivet steel up to a shear stress of about 30,000 lb. per sq.in.,


Shear Stress in 1,000 Lb. per Sq. In., Based on ⅞" Diam. Rivet Shank
Total Applied Load in Thousand Lb.
Displacement in Inches
Dardelet rivet bolt - Maxel steel
Dardelet rivet bolt - Rivet steel
Hot driven river - Rivet steel

Composite curves showing tests on Dardelet "Rivet Bolts" and structural steel rivets. Note the lower displacement for the Rivet Bolts due to the greater static friction between the parts held together

"Lo-Swing" Model K Automatic Lathe

For machining short stubby work, such as bearing races, gear blanks and similar pieces that can be held either on an arbor or in a chuck, the Seneca Falls Machine Co., Seneca Falls, N. Y., has developed a "Lo-Swing" Model K automatic lathe. The machine is of very heavy design, weighing aproximately 8,700 lb., and is built for high speed. It is practical to run the spindle at 2,000 r.p.m. Anti-friction bearings are used throughout, and all shafts and gears are hardened.

The feed for the tool mechanism is obtained through cams, which acting through arms, impart a rocking movement to the 6½-in. tool bars. These tool bars extend through the machine and carry the tool supports at the outer end. Additional tool actuating means are provided by shafts that extend through the tool bars and operate toolslides when desired. If it is necessary to take an angular cut, the tool bar may be rocked into position where it is held securely, and then by means of the additional feeding mechanism the toolslide can be advanced at any desired angle and rate of feed. This type of construction is of use in machining bevel gears.

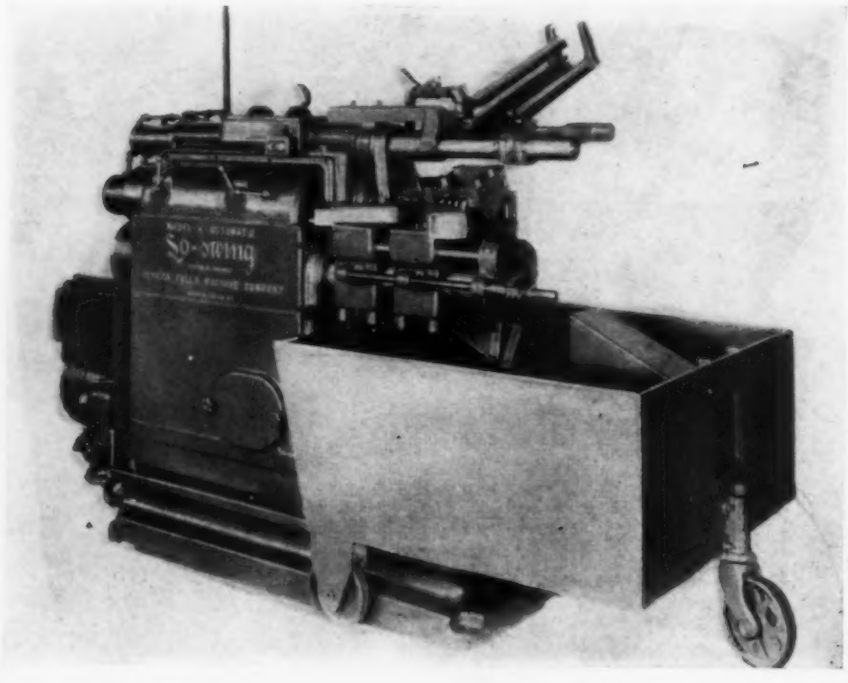
While all feeding movements are obtained by the use of cams, the control mechanism for throwing the machine into and out of rapid traverse, opening and closing the chuck, returning the toolslides, and other operations is actuated hydraulically. The use of hydraulic means

in this connection simplifies the construction of the machine.

Pick-off gears are provided for the feed, rapid traverse and spindle speeds. In providing pick-off gears for rapid traverse, it is possible to time the machine so that work can be produced in the fastest possible time.

As shown, the machine is equipped with an automatic device arranged to load roller bearing races onto a stub arbor, where they are held while being machined. After the race has been completed, it is ejected from the stub arbor hydraulically and separated from the chips. The chips fall into the truck, and the races are conducted through the chute into the square hole shown over the wheel of the chip truck. A tote box or other receptacle can be placed here for finished work. The entire loader is operated hydraulically and safety features are incorporated to protect the machine in case of accident.

The machine can be furnished without the loader as a hand-operated machine or can be equipped with any

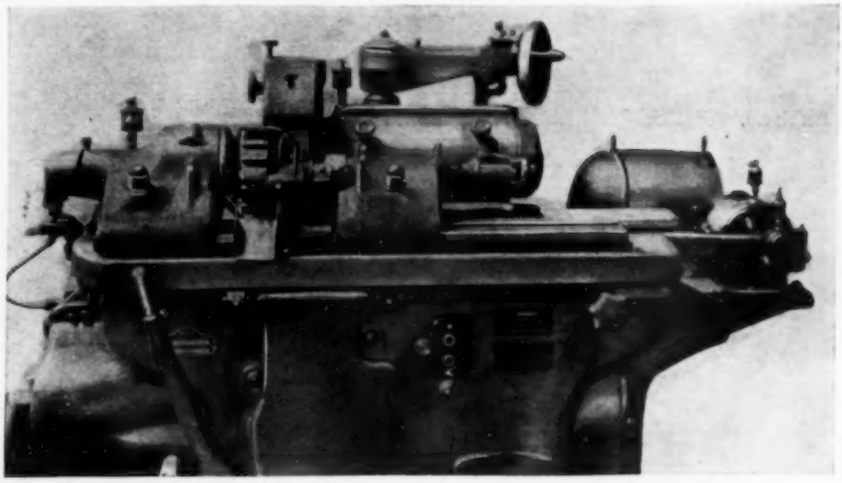


of the company's other automatic loading arrangements. When equipped for hand loading, the machine is started by pressing a lever, after which it will go through a complete cycle and then stop. With automatic loading the cycle is continuous.

Attention has been given to reducing change-over time to a minimum. The machine illustrated is arranged to take races from $\frac{1}{16}$ in. in diam. to 5 in. in diam. The motor is mounted at the rear of the machine, as well as the coolant pump which is individually motor-driven. The chip truck may be removed when full of chips, and another rolled into place.

Landis Automatic Polishing Machine

For the polishing work after the finish-grinding operation, the Landis Tool Co., Waynesboro, Pa., has developed an automatic polishing machine making use of many of the elements of a standard 6x18-in. grinder. Among the types of work that can be done on this machine are piston pins, valve stems and similar parts. Valve tappet production varies from 40 to 50 pieces per min., being regulated by the rapidity with which the carriage could be reciprocated. About 0.0002 in. stock is removed.



Operation of the machine is fully automatic. The operator loads the turret as it indexes. As soon as the turret carries a tappet into the polishing position, the wheel carriage starts to move toward the left-hand end of the machine. Footstock spring tension is released, causing the footstock center to advance into contact with the work. This seats the head of the tappet in the cupped headstock center. Work rotation starts at once with friction driving the work during the polishing operation.

By this time the polishing wheel has started across the tappet stem. As the side of the wheel is about to touch the tappet head, the direction of the wheel carriage movement reverses. The footstock center then withdraws, and a spring-loaded plunger in the headstock center pushes the polished part back to its original position in the turret. The turret indexes, and the finished piece drops into a chute, which carries it to the front of the machine where it drops into a suitable receptacle. One complete reciprocation of the wheel produces a satisfactory polish.

Close-up of the work-rotating turret loaded with valve tappets polished at 40 to 50 per min.

Page "Hi-Tensile" Electrodes

The Page Steel & Wire Co., Monessen, Pa., has developed a coated electrode which gives quiet operation with little or no sputter. The arc is free burning. Grain structure of the weld is essentially the same as that of mild steel and boiler plate base metal. The electrode possesses an extra deep penetration, and the strength of the finished weld is equal to that of the base metal, and has a total elongation of over 30 per cent. It also responds to heat-treatment. The electrode does not require reversed polarity for efficient operation.

"Brocho" Taper Reamer Drills

In the original announcement (*AM* — Vol. 76, p. 220) of these "Brocho" taper reamer drills, distributed by A. C. Bellefleur & Son Co., 136 Garfield Ave., New London, Conn., the trade name was spelled "Brocko," whereas it should have been "Brocho". These taper reamer drills both drill and ream all standard taper and Morse taper holes in one operation. In addition, these taper reamer drills can be made to any taper and size desired from sketches. Sheffield high-speed steel is used for the tools.

"Crescent Junior" Tape-Rule

A smaller and lighter-weight tape rule, known as the "Crescent Junior," has been announced by The Lufkin Rule Co., Saginaw, Mich. This rule also has flexible and rigid features, and is no larger than a watch. It is automatic in winding and is made in two lengths, 4 and 6 ft.

The blade is $\frac{7}{16}$ in. wide and can be projected unsupported to walls or into openings like a rule. It will also

measure circles and odd shapes. The background is dark with the markings in sharp contrast. The inches are graduated to 16ths. The case is chromium-plated and has rounded edges. Weight of the 4-ft. "Crescent Junior" is 3 oz., and diameter of the case is $1\frac{3}{4}$ in. The blade is manually withdrawn and automatically returned by pressing the pushbutton.

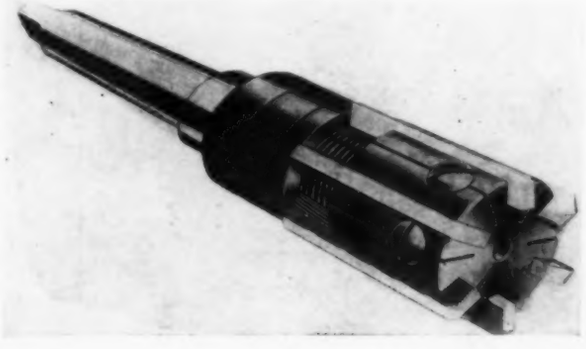
Purox Tip Adaptor

The Linde Air Products Co., 30 E. 42nd St., New York, N. Y., has added the Purox 11-to-00 tip adaptor, which can be used to increase the range of usefulness of the Purox No. 11 welding torch. By means of this adaptor it is now possible to use

the stems and tips of the No. 00-D aircraft welding torch and the stems and tips of the No. 00 welding and lead burning torch on the No. 11 welding torch, thus enabling a welder who has only an occasional light welding job to use the correct welding tips for this small work.

O. K. Solid-Shank Expansion Reamer

An adjustable sizing reamer for finishing operations has been developed by the O. K. Tool Co., Shelton, Conn. This tool combines the company's high-speed steel cutter blades with a drop-forged, chrome-nickel steel body. The blades are locked by a conical wedging screw, spreading the split body against the blade. Thrust of the wedge nut is taken up by the adjusting nuts. Each reamer has a practical range of adjustment. Blades are set at negative spiral and are irregularly spaced for fine finishing work. Specifications list standard stock sizes, right or left hand, special shanks, angles, sizes and lengths.



• PATENTS •

FEBRUARY 9, 1932

Metal-Working Machinery

Riveting Machine. Edward W. Stevens, Detroit, Mich., assigned to Chicago Pneumatic Tool Co. Patent 1,843,935.

Threading Machine. Stanley T. Goss, New Britain, Conn., assigned to The Goss & De Leeuw Machine Co. Patent 1,843,976.

Operating Mechanism for Metal-Cutting Shears. John W. Sheperdson, Worcester, Mass., assigned to Morgan Construction Co. Patent 1,844,107.

Duplex Riveting Machine. Arthur R. Havener, Wayland, Mass., assigned to Judson L. Thomson Mfg. Co. Patent 1,844,119.

Riveting Machine. Arthur R. Havener, Wayland, Mass., assigned to Judson L. Thomson Mfg. Co. Patent 1,844,120.

Machine and Method for Pressing Cup-Shaped Members. Harold C. Dailey, Needham Heights, Mass. Patent 1,844,500.

Flame Cutting Burner Apparatus. Leslie John Hancock, Sutton, Surrey, England. Patent 1,844,574.

Tools and Attachments

Threading Die. Louis W. Gates, New Haven, Conn. Patent 1,843,950.

Screw-Cutting Appliance for Lathes. Karl Tessky, Esslingen-on-the-Nackar, Germany. Patent 1,844,191.

Spacing Tool for Helical Springs. George C. Batz, Topeka, Kans. Patent 1,844,309.

Chuck. Harry E. Sloan, Hartford, and George A. Highberg, West Hartford, Conn., assigned to The Cushman Chuck Co. Patent 1,844,445.

Rotary Cutter. Arthur Spohr and Lewis Skeel, Meadville, Pa. Patent 1,844,446.

Chuck. Robert L. Hibbard, Bellevue, Pa., assigned to William K. Stamets. Patent 1,844,577.

Jaw for Lathe Chucks. Lucius E. Whiton, New London, Conn. Patent 1,844,616.

Spindle Reciprocation Mechanism. Conrad L. Ott and Harold E. Balsiger, Waynesboro, Pa., assigned to Landis Tool Co. Patent 1,844,791.

Sag Eliminating Attachment for Crankshaft Grinding Machines. Herbert M. Sims, Florence, Ala. Patent 1,844,805.

Processes

Method of Lapping Cylinders and Cones. William E. Hoke, Baltimore, Md. Patent 1,843,979.

Method and Means of Butt-Welding. Clarence W. Balke, Highland Park, Ill., assigned to Fansteel Products Co. Inc. Patent 1,844,495.

Method and Apparatus for Centrifugal Casting. Cyrano Tama, Berlin, Germany. Patent 1,844,701.

• TRADE PUBLICATIONS •

CORK PRODUCTS. L. Mundet & Son, Inc., 461 Eighth Ave., New York, N. Y., has issued a catalog, "Jointite Cork Products," giving a compendium of information on the uses of cork for insulation purposes. Included is material for neutralizing sound and vibration under moving machinery.

LATHES. The Boye & Emmes Machine Tool Co., Caldwell Drive, Cincinnati, Ohio, has issued a brochure "Side Lights on the Lathe with the Longer Life," giving complete construction features of its line and illustrating various accessories.

ROLLER BEARINGS. The Tyson Roller Bearing Corp., Massillon, Ohio, has published the second edition of an Engineering Manual, which is available to production, operating and design executives, engineers and superintendents. It is a 26-page book, file size, loose-leaf, containing essential information on the application of Tyson cageless tapered roller bearings.

ROLLER CHAINS AND SPROCKETS. The Chain Belt Co., Milwaukee, Wis., has issued Catalog No. 440 on "Rex Roller Chains and Sprockets." This catalog and engineering data book contains prices, weights and information on the design and application of roller chains, block chains, leaf chains and cut tooth sprockets. The catalog has an exceptionally large section on engineering data and also information on types and applications.

QUENCHING PRACTICE. E. F. Houghton & Co., Philadelphia, Pa., has prepared a treatise "Houghton on Quenching," which outlines the changes which take place in steel during the heat-treating process and the relation of these changes to the resulting physical properties of steel. The importance of the quenching operation is given particular stress, and various quenching media and their properties are discussed.

American Machinist

Reference Book Sheet

SYMBOLS FOR MECHANICS, STRUCTURAL ENGINEERING AND TESTING MATERIALS

Acceleration, angular	α (alpha)
Acceleration, due to gravity	g
Acceleration, linear	a
Angular distance	θ (theta)
Angular velocity	ω (omega)
Area	A
Axes, through any point	X-X Y-Y Z-Z
Breadth	b
Center of rotation	O
Coefficient of sliding friction	f
Concentrated load (same as force)	F
Constants	C
Curvature, radius of	ρ (rho)
Deflection	y
Deflection of a panel point of a truss	Δ (delta)
Density	ρ (rho) or d
Depth	d
Diameter	D
Distance, linear	s
Eccentricity of application of load	e
Efficiency (hydraulic, mechanical, volumetric)	e_h, e_m, e_v
Elasticity, modulus of	E
Elongation, unit	δ (delta)
Force	F
Force in any bar of a framed structure due to a load of unity applied at any point in any direction	u
Frequency (harmonic motion)	f or n
Gyration, radius of	k
Head	H or h
Height	h
Inertia, rectangular moment of	I
Inertia, polar moment of	J
Length	L
Load per unit distance	w
Load, total	W
Mass	m
Modulus of rupture	R
Moment in inch-pounds at any section of a girder due to the moment of one inch-pound applied to the girder at any point	m
Moment of force, including bending moment	M
Neutral axis, distance to extreme fiber	c
Number of revolutions per unit of time	n
Period (harmonic motion)	T
Power, horsepower	P
Pressure per unit of area	p
Radius	r
Ratio between modulus of elasticity of steel and modulus of elasticity of concrete	n
Ratio of the distance from the neutral axis to the outer fiber of a reinforced-concrete beam to the distance from the outer fiber to the point of application of the resultant tensile stress	k
Ratio of the lever arm of the resisting couple in a reinforced-concrete beam to the distance between the outer compressive fiber and the point of application of the resultant tensile stress	j
Reactions	R
Section modulus	Z or S
Statical moment of any area about a given axis	Q
Steel ratio, in reinforced-concrete beams	p
Stress, unit	s
Stress, unit compressive	s_c
Stress, unit tensile	s_t
Stress, unit shear	s_s
Stress, total tensile or total steel, in reinforced concrete	T
Stress, total compressive or total concrete, in reinforced concrete	C
Stress, total shear	V
Stress, unit concrete, in reinforced concrete	f_c
Stress, unit steel, in reinforced concrete	f_s
Stress, unit shear of concrete	v
Temperature, absolute	T
Temperature, ordinary	t
Thickness	d or t
Time	t
Torque	T
Velocity, linear	V or v
Volume	V
Work, or energy	W

American Standard, approved by American Standards Association, Jan. 8, 1932.

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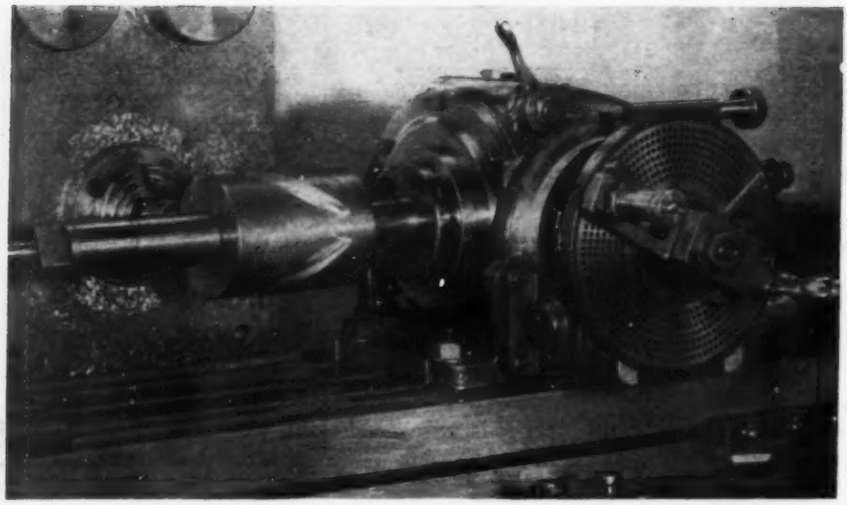
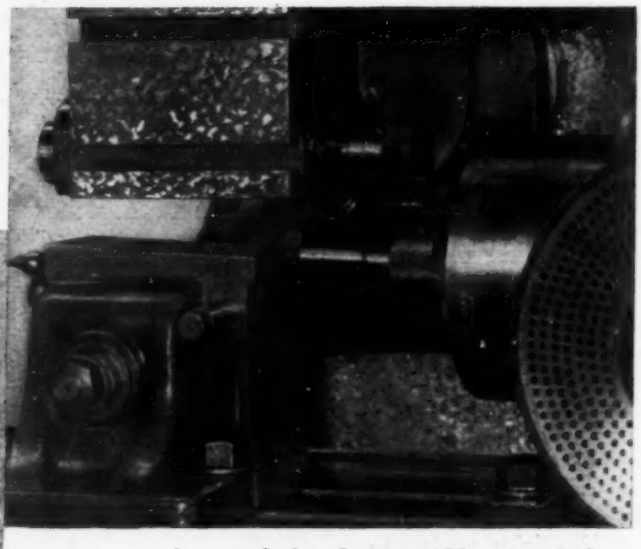


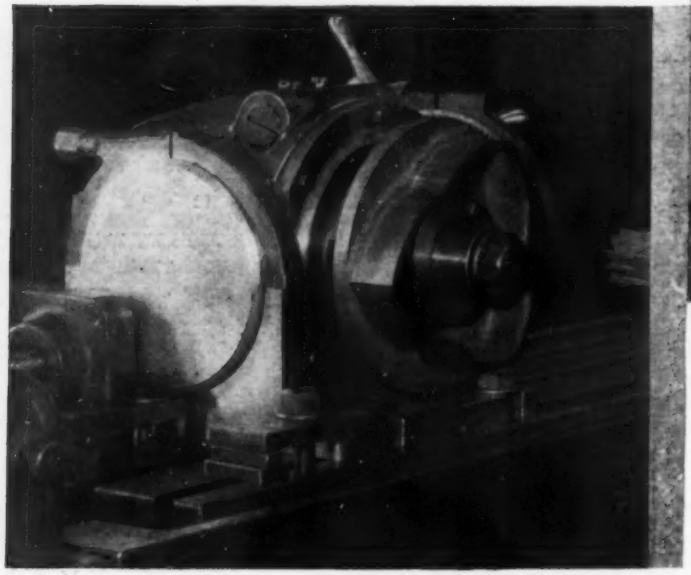
Two Cams Two Threads *and a* Dividing Head

A clutch in the dividing head drive permits the cutting of either right or left-hand leads. Here it is employed on a drum type cam for a fixture assembly

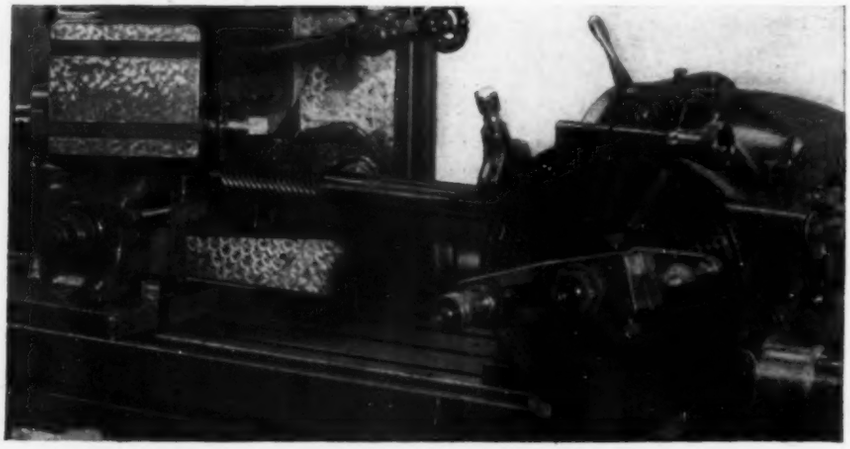
What an ingenious mechanic and a handy machine can do



A tapered thread, too, yields to a single cutter. Tilting the dividing head and adjusting the tailstock to suit make it possible to mill this pipe thread gage



Precision ball bearings preloaded to 1500 lb. plus a 5-in. diameter spindle give the dividing head the accuracy required for work of this kind. The job is a special machine cam of unusual shape



An octuple Acme thread is milled in this set-up. But when it is considered that the head may be set for 40,000 different leads, eight starts seem easy

Photographs by courtesy of Kearney & Trecker Corporation

EDITORIALS

February 25, 1932

K. H. CONDIT • F. H. COLVIN
Editors

Two Years Older

Two years ago *American Machinist* surveyed the equipment in metal-working plants and discovered that forty-eight per cent of it was more than ten years old, and therefore presumably obsolete. It would probably be safe to say today that forty-eight per cent of it is now over twelve years old, in most of the branches of the industry. How much of present equipment is over the ten-year limit is a question but the chances are that the proportion has now risen above the fifty per cent mark.

Exceptions to the general rule will be found among the machine tool builders themselves. Some of them have done excellent work during the last two years in modernizing their plants. But in general the exceptions only prove the rule.

The builders of equipment have been running at but a small fraction of capacity, and much of what they have built has been sold abroad. To build the replacements needed by industry for an orderly ten-per-cent-a-year replacement plan they would have to operate at a much larger fraction of capacity. Obviously, equipment efficiency is lower than it was two years ago, and production costs are higher than they need to be.

The Lycoming Protest

One presidential candidate states that the cost of our Federal government has increased "roughly 450 per cent" during the past twenty years. Whether or not his partisanship has caused him to magnify the figures is beside the point; we know as manufacturers and citizens that our own tax-bills have become an ever more serious drain on our earnings and resources. The share we bear in the metal-working industry has always been out of all proportion. We know that we need relief. And we should know that we are unlikely to get it unless we impress our wishes and necessities upon our representatives in Washington.

We commend to your attention therefore the protest of the men and women in the organization of Lycoming Manufacturing Company, mailed this week to their representatives in Congress. Read it in full in the news columns of this issue and work for similar action in your own plant. It is high time for every individual in the metal-working industry to speak his mind. A luke-warm attitude may spell the defeat of the drive for bureau consolidation and economy. And it might encourage additional uneconomic forays on the public treasury plus consequent increased taxes.

Poor Peter!

The good old practice of robbing Peter to pay Paul is flourishing in these times. In the railroad shops and roundhouses are scores of stored locomotives, supposedly ready for the road but actually stripped of all manner of injector parts, stoker parts and every other kind of part to keep the road engines on the line.

In the automobile plants, and in every other kind of plant where machinery is used, are idle machines that have been made at least temporarily useless because various parts have been removed to keep the active machines moving. Some superintendents have even gone so far as to bring back discarded machines from surplus warehouses, spend a few dollars to make them run after a fashion, and then put them into the production line as stopgaps.

It is certainly tough on Peter Stored Locomotive and Peter Idle Machine, but it is almost equally bad for Paul Active Machine and Paul Road Locomotive because borrowed parts tend

to become makeshifts and tinkered machines are seldom reliable. And the practice which has been so hard on machinery is going to be equally hard on managers and repair crews when the wheels have to turn again. An awful lot of grief is being stored up for somebody—but eventually an awful lot of replacement business for somebody else.

Index for Volume 75

For some years it has been our custom to publish the index for each volume of *American Machinist* as a separate and distinct item. It is furnished entirely without charge as a special service to those subscribers who wish to bind their volumes and who specifically request it.

We are glad to announce that the Index for Volume 75 will be ready during the next week or ten days. If you wish a copy and have not yet notified us, please do so within the next day or two. Though the edition should be more than ample, there is always the possibility of early exhaustion, and we do not want to disappoint.

• CHIPS •

Success seems already to be crowning anti-hoarding campaign . . . President Hoover announces that $34,000,000 has found its way back into circulation . . . or at least $340,000,000 of credit . . . Next and more important step will be to pry bankers loose from their policy of 70 per cent liquidity . . . Treasury Department decides on reconstruction bonds in small denominations to coax further cash out into the open . . . may initiate drives similar to the Liberty Loans . . . That Wall Street views Washington rescue efforts with some satisfaction is proved by the rise in value of N. Y. Stock Exchange seats . . . Exchange will enforce rule against lending customer's shares to shorts after April 1 . . . LaFollette-Costigan bill for direct federal relief passes house but strikes firm snag in Senate . . . Post Office Department announces new postal rates to Central and South America . . . three cents per ounce for letters and two cents for postal cards . . . no foreign first-class mail now on two cent basis . . . Garner proposes unified Department of National Defense plus other departmental consolidations . . . Hoover comes back with broadside advocating wholesale consolidations and reorganizations . . . If their purposes were not so sincere and the need so urgent, one would be reminded of youngsters doing their bits before Christmas to insure the coming of Santa Claus.

France in throes of another change in government . . . must be beginning to understand where she stands with the rest of the world because she is proposing to furnish 50,000,000 gas masks to her civilian population . . . Action is what "they don't have nothin' else but" at Geneva Disarmament Conference . . . League of Nations again makes faces at Japan . . . Japan makes faces back . . . sends ultimatum to China . . . and China says it with bigger guns . . . Japan fits up Manchuria as separate nation . . . new name Ankuo—"land of peace" . . . Sweden will extend gold suspension from February 29, to May 15.

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Ford's new models will directly benefit 5,600 (five-thousand six hundred) plants throughout the country. Every one of them manufactures one kind of part or another for Ford cars.

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Car loadings increase in a week whose normal course is downward . . . American Legion begins to achieve success in war on unemployment . . . 5,748 men and women added to payrolls in Utica . . . 2,759 in Elkhart, Ind. . . . Pittsburgh sheet steel producers set new and higher minimum prices . . . Nash will announce five new models day after tomorrow . . . Engineers recommend merger of New Haven and the Boston & Maine . . . U. S. Steel's modernization campaign reflected in Carnegie's taking over American Steel & Wire plant at Braddock . . . part of plant already demolished to make way for new construction.

Preliminary records of new passenger car registrations in January, as compiled by R. L. Polk & Company, show an increase of 18.83 per cent over December . . . U. S. Department of Commerce estimates 2,639,000 automobiles will have to go to junk pile during 1932 . . . Bendix Aviation Corporation's wheel and brake division, South Bend, Ind., has sufficient orders to run at capacity until mid-April . . . American Tel. & Tel. plans $330,000,000 new construction in 1932 . . . Irving Fisher index of business conditions jumps 3.7 per cent in week . . . American Can places its 1932 tin plate requirements with U. S. Steel . . . $35,000,000 or thereabouts . . . Erie R.R. orders 33,230 tons of rails . . . Nickel Plate, 19,000 tons . . . C.M.St.P. & P.R.R. will spend $5,500,000 on improvements . . . Cadillac and LaSalle sales for first ten days of February show 78 per cent increase over January.

• THE • INDUSTRY • WEEK • BY • WEEK •

NEW YORK

New York's tool market is still lethargic, if anything, more lethargic than it was last week. Indications of betterment in general business have had no effect on tool sales thus far, although sentiment seems a bit better. The Navy is inquiring for a motor-driven mortiser and shaper for Mare Island—which aids New York only in sentiment. Users are duplicating the railroad stunt of taking parts off locomotives in the shop for those on the line—taking parts off machine tools not in use to keep others running. It will mean a lot of tool business some day, but that is small comfort now.

CLEVELAND

Sales of machine tools for February are on January's low level. The only feature has been inquiries from automotive parts, rubber tire, tool, jig and die manufacturers. Even these inquiries are problematical. Employment showed gains due to the release of orders to local manufacturers of parts by Ford Motor. New York Central Railroad returned 1,200 men to work in the Collinwood shops.

PHILADELPHIA

Except for a few small replacement orders, the machinery and machine tool business continued on the same level of inactivity last week. Inquiries were few and held out little prospect for closing. The trade here sees a ray of hope in the situation in Washington. Public work is under severe curtailment, with prospects that subway construction will be seriously retarded.

SOUTHERN DISTRICT

The center of activity in the Southern machinery and machine-tool market, if "activity" is the proper word, has moved eastward, and, in fact, might be declared to be more centrally located than ever. The Texas district has become decidedly quiet, while points in the Atlanta area are far from being what they should. Activity in the New Orleans division is quiet, but promising, but outlying areas from this point are offering the bulk of whatever spotty business there is to be found.

CINCINNATI

There is a feeling that the Government's concentration on relief to the financial situation is causing a favorable reaction in the machine tool market, and because of this the outlook is regarded as at least a shade brighter. Manufacturers book scattered orders from various classes of users, most of which are for single tools. Local selling agents hold their own in the matter of securing orders and have some success in developing prospects.

Progress in Metal-Working and Machinery Markets

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NO CHANGE worthy of note in machine tool and machinery inquiries and sales; the quiet condition of the past several weeks continues with little prospect of immediate change . . . There are some indications that the betterment in general business may mean future improvement, possibly later this spring, but little real upturn is expected until fall . . . The drives against hoarding and unemployment, increasing public sentiment against taxation and the efforts of legislators to better the situation must contribute to this improvement.

NEW YORK notes no change, having had a quiet week with few inquiries . . . Cleveland February sales are maintaining January's low level, though inquiries from all sorts of automotive parts suppliers have possibilities shortly. Release of Ford orders increased employment there . . . Philadelphia has only replacement business, and little of that as a result of curtailment of industrial and civil construction work as a result of shortage of funds . . . Southern District's center of activity has moved eastward to about the center of the area, with Texas quiet, New Orleans offering promise, but outlying areas supplying the spotty business being closed . . . Cincinnati manufacturers are getting a number of small scattered single orders and selling agents are holding their own.

CHICAGO has few orders, fewer inquiries, expects used tool prices to drop still more, is doleful about railroad prospects . . . Detroit awaits Ford's new production, expecting other manufacturers to follow suit and business in tools to step up with it . . . New England has automotive orders for milling and grinding equipment, but is playing cautious . . . Milwaukee has an order for high-production units from an implement manufacturer, but little else thus far.

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CHICAGO

Business in machine tools and shop equipment fails to show improvement, and, unless there should develop a marked change for the better during the remainder of the month, February will close below January. Inquiries are exceedingly few, and cover only absolutely necessary replacement equipment. The hope that with wage conditions adjusted and indicated governmental financial support in prospect, railroads might be expected to devote renewed attention to shop equipment needs seems likely to fail of realization for the present. This at least is the opinion expressed by men having knowledge of railroad conditions. Demand for used tools, poor as it has been for months, seems likely to drop to a yet lower level before it improves.

DETROIT

Few deals for machinery or tools are being consummated. The tendency to mark time, which has characterized the automotive industry for several weeks, is more pronounced than ever. Even orders that had been received are being held up until March. Machinery and machine tool dealers are convinced that a noticeable improvement will be shown in sales as soon as Ford gets under way. In the meantime few inquiries are being received, and very little evidence of model changes is available.

NEW ENGLAND

The situation is no brighter. Inquiries are being received at a minimum rate with resulting orders even less conspicuous. Industry is inclined toward a rosier view of conditions following a general rise in stock values, but wiser heads proclaim this favorable change purely artificial and probably of short duration. Orders for milling and grinding equipment straggle in from automobile companies, and this source still offers the chief support for optimism.

MILWAUKEE

Inquiries from diversified sources in greater number and seemingly likely to produce orders within the near future are the basis of such optimism as is evidenced. Automotive prospects, upon which high hopes were built during recent weeks, have been rather disappointing. Only one manufacturer reports business from automotive sources, and that has been of good volume, largely from one producer who ordered a number of special machines. Others report that automotive business has not materialized since December placements, although it was expected that more would follow the annual shows. An implement manufacturer has placed orders for a few high-production units. Other buyers have done nothing more than place occasional small orders.

MATERIAL TRENDS AND PRICES

Seasonal increase in volume of metal purchasing has not appeared, as yet, in warehouse transactions, while the rate of steel-mill operations is but 28 per cent of capacity as compared with 48 per cent, a year ago. Steel sheets appear as the most likely subjects of further price reduction in the near future. In non-ferrous metals, lead is showing higher price stability than are the others in this group. The price of lead at E. St. Louis has remained unchanged since Dec. 18, 1931. Copper and zinc are reviving, after the mid-February declines, which occurred in either metal. Tin is off but slightly. Prices of fabricated brass and copper materials remain unchanged.

(All prices as of Feb. 19, 1932)

IRON AND STEEL

Pig Iron —	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$10@$11	$10@$12	$13.00
Buffalo, No. 2, Fdry., per gross ton	14@ 15	15@16	17.50
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	10.00	10.00	12.75
Furnace Coke — Connellsville, per net ton	2.25	2.25	2.40
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.25
Steel Shapes — Pittsburgh, base, per 100 lb.	1.50	1.50	1.65

Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.

Chicago	4.62½	Cleveland	4.50	New York	4.75
Cincinnati	4.35	Detroit	4.00		

Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Hot-rolled, No. 10	1.85	3.20	3.00	3.00
Hot-rolled, No. 24	2.40	3.55	3.25	3.50
Galvanized, No. 24	2.90	4.10	3.75	4.00

Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches					
		½	⅝	¾	1	1⅛	1¼
Inches	B.w.g.	Price per Foot					
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.80	3.60	3.60
Cold fin., round or hexagon	3.30	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

Stainless Steel — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

Chromium 15% and under	19.00	Chromium 18 to 23%	23.00
Chromium 15 to 18%	20.50	Chromium 23 to 30%	28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on bolts (except tire and stove) nuts, and lag screws, mill lots 73–10–10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn	6.25
Copper wire, base, Chicago and Cleveland	8.83½
Copper wire, base, N. Y.	8.71
Lead, pigs, E. St. Louis	3.55
Tin, Straits, pigs, spot, N. Y.	21.15
Zinc, slabs, E. St. Louis	2.82½
Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:	
Brass rods, high	10.62½
Brass sheets, high	12.87½
Brass tubing, high	16.12½
Copper, drawn round	13.37½
Copper sheets	15.87½
Copper tubing	15.37½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	28.50
Babbitt, com'l, intermediate grade	34.25
Babbitt, genuine, highest grade	43.00
Solder, bar	17.25
Prices following are in cents per lb., base, Huntington, W. Va.:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.50	2.00	2.00
Light brass	2.00	1.50	1.75
No. 1 rod-brass turnings	2.75	2.50	2.00
Heavy copper	5.00	3.50	3.25
Light copper	4.00	3.00	2.62½

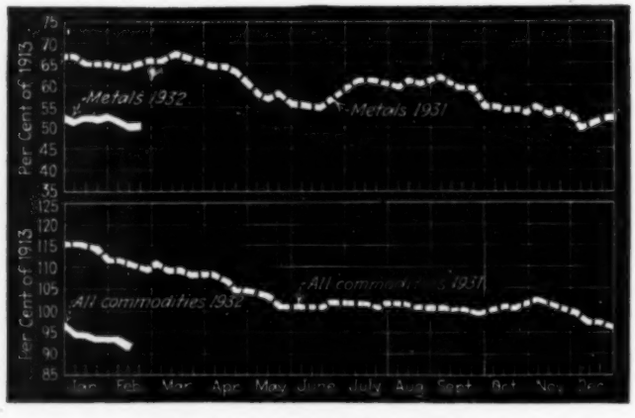
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	40%	40%	40%
Belting, rubber, trans., Grade 1	60–10–10%	60–10%	60%

Lumber — Per M ft., b.m., 12–16 ft. lengths, delivered, N. Y.:

Crating — Southern pine:
1x4-in. ..... $27.00 1x6-in. $26.00

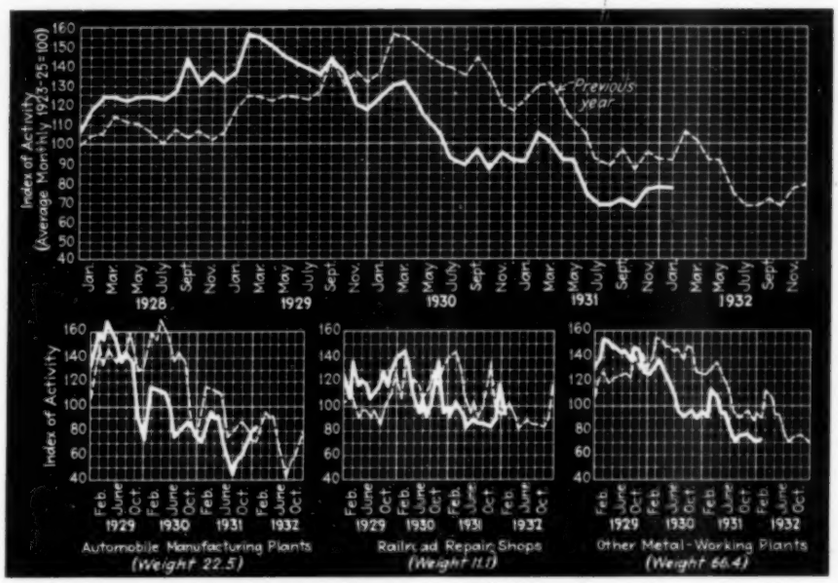
Skids — Spruce:
2x4-in. . $25.00 3x4-in. . $35.00 4x6-in. . $37.00 6x6-in. . $50.00


Per Cent of 1913
Metals 1932
Metals 1931
All commodities 1932
All commodities 1931
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

Metal-Working Production Indexes for January Hold About Even



METAL-WORKING activity in general held even during January, according to reports on consumption of electrical energy for power purposes. This follows two months of upturn in activity, following a more or less static condition for several months previous to November. The final January figure was 77.6, as compared with 77.8 in December, 75.6 in November, 69.4 in October, 71.2 in September, 68 in August and July, and 78.2 in June, 1931. These figures are all adjusted for 26 working days, as are subsequent ones.

The automobile shop index moved up to 83.6 from the 78.1 of December. In previous months it was 65.5 in November (1931) 67.4 in October, 53.7 in September, 43.6 in August, 55.9 in July, 71.3 in June. The railroad repair shop index fell over 20 points from 118 in December to 91.5 in January. In previous months it was 94.9 in November, 1931, 84.5 in October, and 84.0 in September, 85.5 in August, 84.3 in July, and 89.2 in June. Ferrous and non-ferrous metal-working plants outside these two groups had a January index of 72.7, up two points from December, 70.9. In other months it was: November, 76; October, 71; September, 75; August, 73.3; July, 69.3; and June, 78.6.

When the figures are adjusted for seasonal variations, slight revisions occur. The railroad repair shop index drops to 86.5, and the general metal-working index drops to 68.7, while the automobile shop index jumps 15 points to 98. This gives a total seasonally adjusted figure of 77.3, very nearly that of the unadjusted index. Railroad repair shop seasonally adjusted indexes were, in previous months: December, 116; November, 90.1; October, 85.5; September, 87; August, 96.2; July, 92; and June, 96. Similar automobile shop indexes were December, 114.2; November, 78.1; October, 55.4; September, 52; August, 45.3; July, 56.3; and June, 69.8: Similar figures for other metal-working plants are: December, 73.2; November, 78.1; October, 72.5; September, 76.0; August, 79.3; July, 73.5; and June, 82.8. The figures for the entire group were December, 87.2; November, 79.4; October, 70.1; September, 79.1; August, 73.5; July, 71.7; and June, 81.4.

Tool Builders Hold Regional Meeting

The second of a series of regional meetings of the National Machine Tool Builders Association was held in Cleveland Feb. 17. The morning session was devoted to the presentation of reports on the Completed Cost Manual by H. M. KIMPEL, of The Warner & Swasey Company, The 1932 Exposition by G. E. RANDLES of Foote-Burt Company, the association's Index of Orders by Mrs. F. F. SELBERT and a discussion of "Ethical Sales Standards Today." The discussion was led by H. M. LUCAS of Lucas Machine Tool Co., CHARLES S. STILLWELL of Warner & Swasey Co., W. BAKER of Baker Bros., Inc., and F. H. CHAPIN of National Acme Co.

Modernization was the theme of the luncheon meeting. EARL WHITEHORNE of McGraw-Hill Publishing Co. gave a progress report on the movement for modernization of industrial equipment, which is being developed by the business press. TELL BERNA of National Acme Co. presented a report of the association study on obsolescence in the equipment of machine tool builders' own plants. The discussion which followed recognized the need for leadership on the part of the machine tool industry in setting an example in the replacement of obsolete equipment, just as soon as business conditions make it possible to justify the investment. In discussing necessary adjustment to present conditions, ROBERT M. GAYLORD of Ingersoll Milling Machine Co. and president of the association urged a wider use of industry statistics and the expansion of the association's own statistics to embrace the compilation of dollar values.

Trade Crisis Is Meeting Subject

"The Crisis in World Finance and Trade" will be the general subject of the semi-annual meeting of The Academy of Political Science at the Hotel Astor, April 13. "The Breakdown in World Trade" will be the subject of the morning session, "War Debts and Reparations" that of the afternoon session, and "World Organization in Finance and Trade" that of the dinner session. Distinguished American and European experts will be included among the speakers, explaining why there is a breakdown in reparations and trade, the effect of currency depreciations on international trade, world tariffs and their effect on the movement of goods, Germany and her creditors, and the war debts problem, political and economic.

New Engineering Cooperation

As we go to press we receive the following telegraphic release from Cincinnati Milling Machine and Cincinnati Grinders, Inc., and the Heald Machine Company:

"The Cincinnati Milling Machine Co. and its subsidiary, Cincinnati Grinders Incorporated of Cincinnati, and the Heald Machine Co. of Worcester, Mass., have concluded a cooperative arrangement which will be mutually advantageous in the further development of their respective lines of manufacture. These companies have for a long period of years made many valuable contributions to the industries they serve, and they believe that by making the engineering research and grinding knowledge of each company available to the engineers of the others a more complete service in internal and external grinding can be rendered to all users."

American Tool Plans Exhibition

The following announcement is released by The American Tool Works Company:

"Confidence in the future of the machine tool industry is evidenced by the elaborate demonstration and exhibition of its new models by The American Tool Works Company, Cincinnati, Ohio, to be held at its plant March 7 to 12.

"In addition to the initial public showing and demonstration of the new "American" 22-in., 100-hp. Super-Lathe the company is building for General Electric Co., twenty-three of its latest type standard models of "American" lathes, radial drills and shapers will demonstrate the most modern and approved methods of metal cutting, using speeds and feeds permitted by the most advanced types of cutting tools.

"The feature of this demonstration will be the performance of the new "American" Super-Lathe, which has been developed for the General Electric Company primarily for the testing of cemented carbide cutting tools in order to establish their maximum commercial speed and feed rates in cutting various kinds of ferrous and non-ferrous metals. This lathe represents a radical departure from long-established principles of lathe design, and although its swing capacity is limited to 22 in., it is proportioned to transmit the full capacity of its 100-hp., 6-to-1, adjustable-speed driving motor."

Plan Loan Fund for Needy Engineers

Latest activity of the Engineers' Emergency Committee for Employment, founded by the four founder societies, is a national relief fund for engineers, being raised and to be handled by a committee for the distribution of loans under the fund with headquarters in the Engineering Societies Bldg., 29 W. 39th St., New York, N. Y. Loans are to be made on the basis of a revolving fund for the briefest possible period consistent with providing emergency service. Loan recipients are to make at least partial repayment as soon as regular work or income is secured in order to reimburse the fund and make it possible to use the same fund for others. The fund will be centralized because it is not large enough to divide among the many local sections in various communities.

A. C. F. Shifts Motors Executives

Reorganization of executive branches of American Car & Foundry Motors Co., subsidiary of American Car & Foundry, has been effected as a preliminary to the inauguration of a more aggressive sales policy, production of better products and curtailment of expense, according to an announcement. Principal changes are coordination of the motor company's activities with those of the parent organization and the assumption by WILLIAM H. WOODIN, head of American Car & Foundry, of the duties of president of the automotive subsidiary, succeeding C. S. SALE. FRANK JAY, formerly bus representative in New England has been elected vice-president to succeed W. L. STANCLIFFE, resigned. H. W. WOLFF, vice-president in charge of sales of American Car & Foundry, has taken over supervision of sales in the motors unit. F. A. STEVENSON, vice-president in charge of operations of American Car & Foundry, will take over the manufacturing department, and G. R. SCANLAND, vice-president in charge of finance of the parent corporation, will carry out the same duties in the motors division.

THE BUSINESS WEEK

February 24, 1932

New emergency banking legislation has stimulated speculative activity in security and commodity markets by arousing renewed expectation of a final check to deflationary forces, but business activity has so far shown no sign of response . . . Most current indicators moved to lower levels by the middle of February . . . Building contracts have practically dried up with the disappearance of public construction . . . Electric power output is depressed by unseasonal weather . . . Carloadings continue slack except for sporadic spurts of coal shipments . . . Steel production still awaits acceleration from automobile demand expected to be released, now that Ford plans are revealed . . . Foreign trade has relapsed to pre-war levels, and prospects for progress in international cooperation on reparations and peace problems are not improved . . . Domestic currency hoarding and bank credit contraction have so far shown no marked change in response to Administration efforts, but immediate obstacles to aggressive Federal Reserve open market operations and credit expansion will be removed by the banking measures being rushed through Congress, and early action may be expected . . . Effective re-inflationary influence of these measures upon commodity values, employment and consumer purchasing power depends now upon prompt cooperation of member banks in expanding credit in commercial channels and initiative of business concerns in insisting upon increased credit accommodation to add to payrolls, replenish supplies, improve equipment.

© The Business Week

Lycoming Protests Tax Burden

Lycoming Mfg. Co., Williamsport, Pa., through its president, W. H. BEAL, has begun a campaign to place on record "a unified protest against the burden of present and proposed Federal taxation and for drastically reducing the cost of maintaining the Federal Government." Employees of the company are not only sending in these protests to U. S. Senators and Representatives for their own Congressional District, but also sending copies to Chambers of Commerce throughout the country and to other interested parties. The letter follows in full:

This letter is addressed to you by those of your constituents whose signatures are affixed, for the purpose of placing on record a unified protest against the burden of present and proposed Federal taxation, and for the purpose of recording our firm conviction that the cost of maintaining the Federal government must and shall be drastically reduced.

The national budget for the fiscal year ending June 30, 1932, calls for expenditure of four billion, three hundred sixty-one millions of dollars against an estimated total income of two billion, two hundred thirty-eight millions, with an indicated deficit of two billion, one hundred twenty-three millions.

Facing a similar situation during the past two years, and with relatively reduced incomes, private industries have applied a solution to this problem by a thorough slashing of the costs of doing business.

Incomes of practically all citizens have been severely curtailed. A notable exception is the salary and wage scale enjoyed by government employees. There is held to be no justifiable excuse for the maintainance of this scale of compensation at a time when the rest of our citizens, who are here in the position of employer, are bending every effort to put an end to the economic depression.

We respectfully petition you, as our representative, to bring to bear all the effort and pressure at your command to effect the following results:

1. A thorough reduction of the Federal salary and wage scale.
2. The elimination of all government positions and functions which constitute a duplication of the position or function in another department or bureau.
3. The elimination of every bureau, position and function of the Federal service, the maintenance of which is not consonant with strictest economy.

In brief, we hereby record our conviction that Congress and other Government officials must find ways and means to reduce taxes and that such reduction must come about principally through a wholesale reduction in the expenditures of the Federal government.

We are very much in earnest in asking you to use every effort to inaugurate and continuously support the program we have outlined.

Mechanical Engineering Standards Reviewed by A. S. A.

THE American Standards Association has recently reviewed mechanical engineering projects under ASA procedure. Committee B1, on Standardization and Unification of Screw Threads, has completed a survey on samples of threaded screws and bolts to determine present screw-thread practice and is now working on a similar survey of nuts. The sponsor bodies intend to publish a comprehensive summary of the measurements as soon as completed. Subcommittee 3 on Special Threads and the Twelve-Pitch Series has recommended the establishment of a series of 12-pitch threads with tolerances suitable for general-purpose application, tolerances on the nut threads to be given in accordance with Class 2 fit, and tolerances on the screws in accordance with Class 2 and Class 3 fits. This committee also recommended the setting up of a series of 8-pitch threads for diameters from 1 to 3 in., inclusive, the sizes from 1 to 2 in., inclusive, to step up by $\frac{1}{8}$ in., and the larger sizes by $\frac{1}{4}$ in. Tolerances according to Class 2 and Class 3 fits were recommended for the bolts and studs, and Class 2 tolerances for the nuts. The 8-pitch threads for the diameters of $1\frac{1}{8}$, $1\frac{5}{8}$, and $1\frac{7}{8}$ in. take care of the needs of the piping industry for these sizes in making flanged pipe connections. A new subcommittee on Wood Screws has been organized, which is proposing that the minor diameter of screws be made 65 per cent of the major diameter, with a permissible variation of plus or minus 4 per cent. No decision has as yet been reached. One other problem is the extension of fine thread series to diameters above $1\frac{1}{2}$ in. Subcommittee B2, on Pipe Threads, has worked mainly in rearrangement of the data contained in the American Standard for Pipe Thread and in the method of gaging taper threads. The subcommittee has recommended that limit gages of the plug-and-ring type, indicating tolerance of plus and minus one turn, as well as the basic size, be added. Under discussion is the question of whether it will be possible to unify the thread lengths of the existing American Standard taper threads as generally used for steam, gas, and water pipes, fittings, and valves, on the one hand, and the greater thread lengths of the corresponding A.P.I. taper pipe threads according to A.P.I. Standard 5 L, used for pipe lines for oil, on the other. Work on plumbers' threads is still going on. A specification recently adopted by conduit manufacturers for screw threads for rigid electrical conduit is being submitted to the subcommittee concerned for its consideration.

Annular Ball Bearings

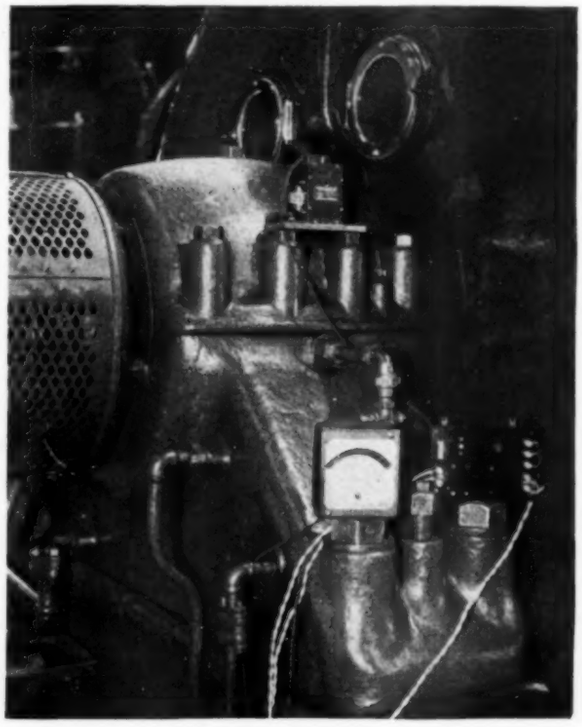
Committee B3, on Ball and Roller Bearings, has published an American Standard for single-row annular ball bearings and Recommended Practice for wide type annular ball and roller bearings. It is now considering standardization of nomenclature for elements of annular and thrust ball bearings. Important is the development of a proposal concerning a series of standard tapered roller bearings comprising 21 light, 19 medium, and 18 heavy bearings ranging in bore from $\frac{3}{8}$ to $4\frac{1}{2}$ in., and meant to replace over 1,000 stock bearings now extensively used.

Committee B4, on Allowances and Tolerances for Cylindrical Parts and Limit Gages, has appointed a working committee to deal with the main problems at present under consideration, including addition of a basic shaft system to the basic hole system.

Small Tools

Committee B5, on Small Tools and Machine Tool Elements, has now one subgroup continuing its work on the development of certain details connected with tapers, particularly of tangs, slots, and drift keys, which will report in the near future. A revised draft of a proposed American Standard for Lathe Spindle Noses has been distributed to industry for criticism and comment, and the new types are now being tested under workshop conditions. A new committee, formed for designations and working ranges for machine tools, will first take up standardization of the designations and working ranges for planers, engine lathes, cylindrical grinders, milling machines, and radial drills. The subcommittee on Splines and Splined Shafts has practically completed a tentative proposal on splines for machine tools, and is working on one on splines for automotive use. A subcommittee on Electric Welding Dies and Electrode Holders has carried its work to a point where it is felt that the various types of electrode bodies and tips for electric resistance welding machines can be reduced to a small number, and that two series, one with a taper fit and one with a thread attachment, may be sufficient. Samples of these two types are now being tested. One technical committee considered a proposal for milling machine table widths but found it to be of no great importance. Value was placed, however, on the spacing of T-slots for five different ranges of table widths. The widths and other dimensions of T-slots have already been laid down as American Tentative Standards for T-bolts, their Bolts, Nuts, Tongues, and Cutters. A draft on this subject has been practically completed and will be sent to a number of industrial concerns for comment as soon as some minor points have been settled.

Committee B6, on Standardization of Gears, has under consideration a pro-



Bolted to the machine under investigation, this GE electrical vibration detector measures vibration in thousandths of an inch and transfers readings to a direct-reading meter and an oscillograph

posal for Gearing Nomenclature applying to spur, helical, herringbone, bevel, and worm gears, adopted recently by the American Gear Manufacturers Association, and includes a complete set of symbols for all elements having a dimensional value, and also a series of abbreviations. It will soon submit a proposed standard for Tooth Form of the 14½-deg. and 20-deg. Full Depth Involute System, and is also developing a draft of a standard for herringbone gears and another on gear materials and blanks.

Committee B16, on Pipe Flanges and Fittings, has a subcommittee which has made considerable progress toward revision and supplementing of the American Tentative Standard on Steel Pipe Flanges and Flanged Fittings for Maximum WSP of 250, 400, 600, 900, and 1,350 lb. per sq.in.

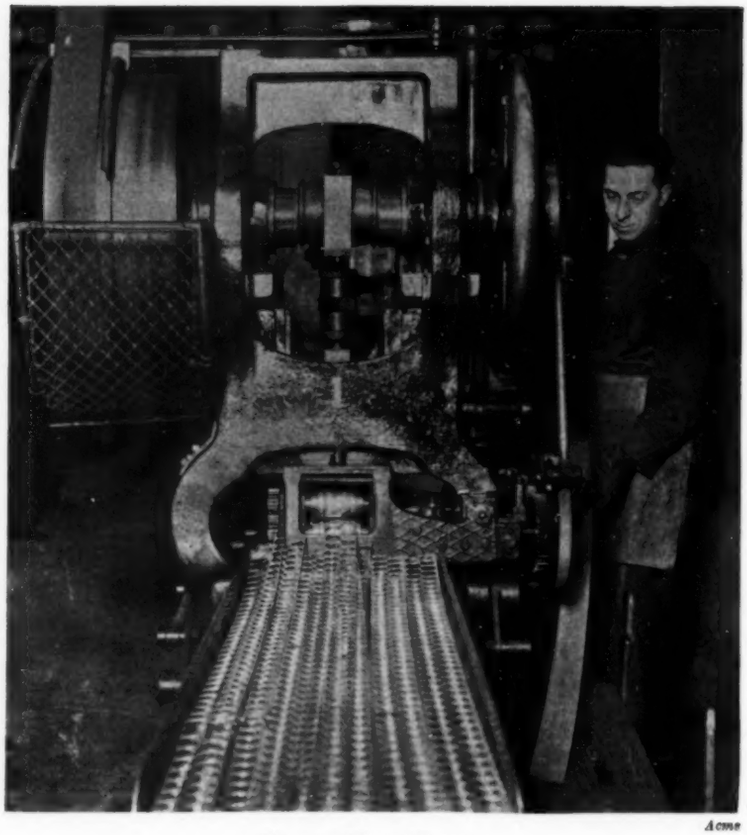
Revise Shafting Standards

Committee B17, on Standardization of Shafting, is revising four standards on Diameters and Lengths of Cold-Finished Shafting; Standard Widths and Heights of Square and Flat Stock Keys; Square and Flat Plain Taper Stock Keys, and Square and Flat Gib Head Taper Stock Keys. A questionnaire is to be sent to industry soon on the matter of an extension of the series of shafting diameters to 8 in., inclusive, on the first of these. The term "cold finished" will be abolished and it will be made clear that the shafting referred to belongs to one of three types: cold-drawn; turned and polished; or turned, ground, and polished.

A new committee on Rotating Tool Shanks was organized last December, and will deal with the standardization of such dimensions of rotary tools (drills, reamers, bits, etc.) as are not covered by other technical committees. That is, it will not only consider squares for shanks of rotary tools, but also, for example, the shank diameters of round shank type reamers and of drills with cylindrical shanks.

A new committee on Nomenclature for lathe tools has been organized and has outlined a tentative program for work. A new committee was also organized on Drill Head Spindles and Bearings, after the desirability of standardizing multiple spindle drill heads had been emphasized by a representative of a large automobile concern. Emphasis was laid on the considerable savings that will result from interchangeability between heads of old and new design in regard to spindles.

Two T sizes are proposed as additions to those given in existing standards and in one it is proposed to add the depth of insertion of the key into the shaft. A new table giving a series of nine large "stock" keys and sizes from 1½x1 in. to 6x4 in. but not matched to any particular shaft diameters is also proposed as an addition. The revised standard will emphasize that the "stock" keys referred to are those commonly used, for example, in transmitting shafting and supposed to be readily available for manufacturers or distributors. "Fitted" keys, as required in more refined machinery and calling for closer tolerances (or a plus, instead of a minus, tolerance on key widths) do not fall within the scope of work of this committee.



Acme

How to Make Money

Cutting silver blanks for the new Iraq coinage at the Royal Mint, London. This is one case where an inbuilt scrap cutter would not be a money saver

New Bolt Proportions

Committee B18, on Bolt, Nut, and Rivet Proportions, is recommending a revision and supplementing of the American Tentative Standard on Dimensions of Wrench-Head Bolts and Nuts, and Wrench Openings concerning mainly a change in the width across flats and the thickness of certain types and sizes of nuts. It is also recommending that a series of American Standard heavy heads from ¼ in. to 3 in., and a series of American Standard heavy nuts, ¼ to 4 in., be added, particularly for use in pipe flanges and flange fittings. A proposed standard for Socket Type Set and Capscrews is expected to be published soon for general criticism and comment.

Committee B27, on Plain and Lock Washers, has completed a proposed American Tentative Standard on Lock Washers, which has been published for general criticism and comment, and lists lock washers for a number of wrench-head bolt heads and nuts and for machine screws.

Subcommittee B36, on Standardization of Dimensions and Material of Wrought Iron and Wrought Steel Pipe and Tubing, has developed a proposed American Tentative Standard on Wrought Iron and Steel Pipe for Service at a Maximum Temperature of 450 deg. F.

This proposal gives the wall thickness, weight, hydrostatic test pressure and theoretical, circumferential (for 1,000 lb. internal pressure) of welded and seamless steel pipe and welded wrought iron pipe.

Committee B41, on Stock Sizes, Shapes, and Lengths for Iron and Steel Bars, has completed the list of personnel for three subcommittees, on Hot-Rolled Steels, Cold-Finished Steels, and Hot-Rolled Iron. The subcommittee on Cold-Finished Steels has decided to use the manufacturers' standard practice as the basis for its first proposals for shapes, dimensions and tolerances.

Forged Tool Practice Now in Printed Form

Revised simplified practice recommendation R17-31, on Forged Tools, announced some time ago in *American Machinist*, is now available in printed form, according to an announcement by the division of simplified practice of the Bureau of Standards. Several items have been included in the revised recommendation to meet railroad require-

ments and other consumer demands. The tool-eye number has been incorporated in the list and is indicated opposite each item where it is part of the tool in question. In addition, a schedule of standard lengths has been included, where applicable. The variety of forged tool items has been reduced from 665 to 431, and eye sizes from 120 to 10. Copies of the illustrated book can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for $0.15 each.

Cutler-Hammer Plants Consolidated

Cutler-Hammer Manufacturing Co., Milwaukee, is closing its Bantam (Conn.) plant, and transferring its equipment and work to its modern plant in upper New York City. No additional machinery purchases will be made. Original plans to move the Bantam plant to Milwaukee were discarded, largely because of the high tax rate in Wisconsin and the uncertainty of legislative action.

According to FRANK R. BACON, president, the company not long ago considered replacing its old buildings in Milwaukee, involving a total outlay of $500,000, but plans were dropped because of business conditions and the present tax situation. A surtax for the unemployed imposed by the last special session of the legislature will greatly increase the normal income tax on large personal incomes. The rates imposed are the same as the normal tax, but unlike the normal tax the surtax does not permit deduction of capital losses or dividends from Wisconsin corporations. A big scare was thrown in the face of Wisconsin manufacturers by Governor LaFollette in his recent message to the emergency session of the legislature when he wrote: "The use of the taxing power is an effective instrument with which to distribute money to enable workers and farmers to trade with one another. Our problem is the redistribution of our purchasing power."

An expansion program for the Milwaukee plant of the Pittsburgh Plate Glass Co. will be held up also, according to LUDINGTON PATTON, vice-president. Instead, expansion will be concentrated in other units outside the state, chiefly in New Jersey.

• BUSINESS ITEMS •

Through the formation of Faraday Refrigerator Corp., the General Motors Corp. has entered the gas-refrigerator field with a view to supplementing its line of electric refrigerators produced by its wholly owned subsidiary, Frigidaire Corp. The Faraday Co., with headquarters in Dayton, Ohio, is a subsidiary of Frigidaire. Its plant in Dayton, according to news reports, has been completely tooled and production is expected to increase steadily during the next few months. The new products will be marketed through the merchandising organizations of gas public-utility companies. According to the announcement, experimental work has been carried on for several years to develop this refrigerator of the absorption type.

Permite Resalum, new aluminum preservative developed by Aluminum Industries, Inc., is now being manufactured at a rate of 2,500 gal. daily, according to HARRY J. HATER, general manager.

Northern Corrugating Co., Green Bay, Wis., manufacturer of sheet steel stampings and other sheet steel products, has changed its name to Norcor Mfg. Co.

Manufacture of typewriters for the Canadian and British Empire markets is to be undertaken in Toronto, Ont., immediately by L. C. Smith and Corona Typewriters of Canada, Ltd., subsidiary of L. C. Smith and Corona Typewriters, Inc., of New York. The percentage of Canadian materials will be sufficient to meet the tariff requirements of various British Empire countries.

Schoitz Tool, Gear & Machine Works, Waterloo, Iowa, has purchased the building it occupies. According to OTTO A. SCHOITZ, president, the entire building will be remodeled shortly.

Segal Lock Co., Norwalk, Conn., will bring additional manufacturing units of its organization to Norwalk with the view of centralizing all production in that city ultimately.

Petersen Tool & Machine Co., Cudahy, Wis., has been incorporated to manufacture and sell tools, dies, machinery appliances and equipment, by HENRY G. PETERSEN, E. C. NICKELSEN and EUGENE V. MOLNAR. Capital consists of 5,000 shares no par value common stock.

Orders

Republic Steel Corp. started five sheet mills at Warren, Ohio, and is accumulating sheet bars for the first time in two years.

The 1932 road improvement budget of Chicago, Milwaukee, St. Paul & Pacific Railroad will involve expenditure of $5,500,000. The rail program will take $1,938,000; ballast, $681,000; bridges, $860,000; grade separations, $923,000, including a $500,000 job in Milwaukee; Evanston, Ill., track elevation, $280,000, and miscellaneous improvements, $870,000. These items include operating charges incidental to the work, but no pay rolls.

Bendix Aviation Corp., Chicago, is keeping its airplane, wheel and brake division, South Bend, Ill., on full-time operation as a result of additional business and will make necessary machinery installations and changes after working hours. The division now has sufficient orders to run at capacity until mid-April.

American Can Co.'s 1932 orders for tin plate have been placed with the U. S. Steel Corp., amounting to approximately $35,000,000.

Erie Railroad has ordered 33,230 tons of steel rails; Nickel Plate Railroad, 19,000 tons.

Automotive

When Ford Motor Car Co. begins production late this month or early next of its eight-cylinder car and in addition brings out its entirely changed design of the Model A, 5,600 other companies which service Ford with supplies will start also. When the plant is in normal production, 3,200 of the 5,600 firms are always on Ford orders. There are now 65,000 people on the Ford factory payroll, either whole or part time, an increase of 8,000 since the first of the year.

Graham-Paige has the largest force at work since June, 1930, and is increasing its February schedule.

Chevrolet, maintaining its 1931 employment average of 25,000, unofficially estimated February production at 55,000 units.

Hudson Motor Car Co.'s assembly line, because of rising sales, has returned to a full eight-hour shift and six-day-a-week schedule.

Chrysler estimates a February production of 21,000 units, up 40 per cent from January.

Packard is employing 8,600 men five days a week, eight hours a day, the largest number in three years.

Continental Motors Corp., Detroit, has purchased the plant and assets of deVaux-Hall Motors Corp., Grand Rapids, Mich. Continental, well-known manufacturer of gasoline engines for industrial and automotive purposes, thus enters the automobile manufacturing business. According to W. R. ANGELL, president, the entry was made only after a "careful study of economic conditions affecting the probable sale of motor cars in the next five years." NORMAN DEVAUX will remain in charge of the motor car division, and operations will be continued under the existing personnel. The Oakland, Calif., unit of the De Vaux Company remains in the hands of the receivers.

Miscellaneous

Midland Steel Products Co. has completed arrangements with Denes & Friedman, Vienna, Austria, for the manufacture and sale of Midland Steeldraulic four-wheel brakes in Europe, according to an announcement by E. J. KULAS, president of the American company.

Warehouse of the Marshalltown (Iowa) Trowel Co., 112 So. Eighth Ave., was destroyed by fire the night of Feb. 7 with a loss of nearly $50,000. E. L. WILLIAMS is president. Plans for rebuilding will be taken up at once and a modern plant will be erected.

The first all-welded vessel in the Navy was launched Feb. 18 at Boston Navy Yard. She is a 65½-ft. tug, of 17½-ft. beam with a displacement of 62 tons. Cost of construction was $60,000. The launching itself was as unusual as the tug. Instead of sliding down the ways it was placed in the water by a huge crane.

American Iron & Steel Institute has leased office space in Empire State Bldg., New York, and will remove from 75 West St., New York, some time before May 1.

PERSONALS

CHARLES M. SCHWAB, at 18 a grocer's clerk at $2.50 a week, at 35 president of the Carnegie Steel Co., and at 41 beginning the building of his own Bethlehem Steel into a $700,000,000 industry, celebrated his 70th birthday Feb. 18. During the past two years he has been gradually withdrawing from a number of his business connections, and announced on his birthday that he had resigned from all boards except three. His business associates presented him with a 16-cyl. car on his birthday.

CLARENCE D. CHAMBERLIN has been elected president of Chamberlin Aircraft Corp., Jersey City, N. J., organized for the manufacture of airplanes and airplane parts.

A. FLOWER, formerly production manager for Trojan, Ltd., Croydon, England, has become director of Zephyr Pistons, Ltd., Lowestoft, England, having taken over control of the latter company with a view to developing a bi-metal piston.

HARRY L. GAGE, vice-president of B. Altman & Co., New York, has been elected a director of Mergenthaler Linotype Co., Brooklyn, to fill the vacancy caused by the resignation of OGDEN L. MILLS on becoming Secretary of the Treasury. Previous to his connection with Altman, Mr. Gage was typographical adviser to Mergenthaler.

BENJAMIN JEROME has resigned from his position as quality engineer for H. H. Franklin Mfg. Co., Syracuse, N. Y., after two years in the position. Previously he had been connected for 22 years in executive engineering capacities with several leading automobile companies.

L. M. JOHNSTON, formerly vice-president of A. M. Byers Co., Pittsburgh, has been elected president of Keystone Driller Co., Beaver Falls, Pa., drilling equipment manufacturer. Other officers are E. C. REBESKE, vice-president; R. R. DOWNIE, secretary, and C. T. SMITH, treasurer. Mr. Rebeske was formerly treasurer and secretary of Union Drawn Steel Co., Beaver Falls.

RALPH M. MATTHIESSEN, New York City, has been elected president and general manager of Western Clock Co., Peru, Ill.

ALFRED J. MCALLISTER, formerly secretary and treasurer of Fairfield Mfg. Co., Lafayette, Ind., has been elected president and treasurer.

WALTER J. MOLTRUP has been elected president of Moltrup Steel Products Co., Beaver Falls, Pa., succeeding his brother, the late J. T. MOLTRUP. F. S. WARD, recently vice-president and assistant treasurer, has been made vice-president, with M. L. MCGAUGHEY the new assistant treasurer. J. L. PHILLIPS has been re-elected secretary and treasurer.

J. B. NORDHOLT and C. C. SMITH, formerly with Toledo (Ohio) Steel Casting Co., have been made vice-presidents and directors of Industrial Steel Casting Co., Toledo.

FREDERICK SIEFKE, vice-president and manager, JOHN H. MILLER, secretary and chief engineer, and EDWARD E. CHAPIN, assistant treasurer and chief chemist, has been added to the directorship of the firm of Robert Sayre Kent, Inc., 383 Jay St., Brooklyn, consulting engineer.

ALFRED M. SMITH has been elected president of Tubular Products Co., Southington, Conn., manufacturer of automobile brass tubes, oil line tubes, ignition heater and other tubular products. Other officers are CHARLES B. SIMMONS, vice-president; CLIFTON I. STONE, secretary-treasurer, and ORVILLE H. BAILEY, factory manager. These, with LEO DAVIS of South Norwalk, Conn., are also directors.

J. W. THOMAS, formerly vice-president and general manager of Firestone Tire & Rubber Co., Akron, Ohio, has been elected president to succeed HARVEY S. FIRESTONE, who has been elected chairman of the board of directors. Mr. Thomas has been a vice-president for the last 12 years.

WILLIAM WHITE, Waterbury, Conn., has been elected president of Waterbury Clock Co. to succeed the late C. W. CURTISS. Other officers and directors were reelected at the same time.

Operating

M. I. DORFAN, until recently manager of the dust collector division of Pangborn Corp., Hagerstown, Md., has been appointed manager of this division of Blaw-Knox Co., Blawnox, Pa.

DR. HARRY P. EVANS, chief metallurgist for Hubbard Steel Foundry Co., East Chicago, Ind., and formerly chief metallurgist for Pettingbone Mulliken Co., Chicago, has been appointed chief metallurgist for Firestone Steel Products Co., Akron, Ohio.

A. G. JANES, for the last 2½ years a foundry engineer in Russia, has returned to this country. Previous to his Soviet contract, Mr. Janes had been connected with Interstate Foundry Co., and Erie Malleable Iron Co.

W. A. ROSENBERGER has been advanced to the office of chief engineer of Pangborn Corp., Hagerstown, Md., manufacturer of blast cleaning and dust-collecting equipment.

JAMES TIERNEY, superintendent of the South side plant, H. B. Smith Co., Westfield, Mass., was honored Feb. 15 on the completion of 55 years' service for the company. EDWIN W. SMITH, president, presented him with a gold watch and chain given by his associates.

Sales

HERBERT J. HILLBORN, formerly designing engineer with Koehring Co., Milwaukee, has become factory representative in Northern Illinois and Iowa for Superior Steel Products Corp., Milwaukee.

B. L. JONES has been appointed sales manager for Wilson Welder & Metals Co., Inc., North Bergen, N. J. He was formerly with Air Reduction Sales Co.

W. J. REEDER has been appointed manager of the St. Louis branch office, Bailey Meter Co., Cleveland. He has been with the Chicago branch for the last seven years.

R. S. SCHMIEDER, for 18 years connected with Milcor Steel Co., Milwaukee, Wis., has joined Super Steel Products Co., Milwaukee, which has just placed on the market a new Super extruded aluminum skylight.

Associations

CORBIN T. EDDY, assistant professor of physical metallurgy, Michigan College of Mining & Technology, will receive the first Alfred Nobel Memorial prize to be awarded. This prize, honoring the famous American civil engineer, is granted for the outstanding paper by an engineer under 30 years of age which appears in the publications of the A.I.M.E., A.S.C.E., A.S.M.E., A.I.E.E., or W.S.E. His paper "Arsenic Elimination in the Reverberatory Refining of Native Copper," was delivered at the Feb., 1931, annual meeting of the A.I.M.E.

W. E. SANDERS, of the Muncie Products division, General Motors Corp., has been elected chairman of the new Muncie (Ind.) local section of the A.S.S.T.; R. J. PETERS, Warner Gear Co., has been elected vice-chairman; E. M. KINGSLEY, of Muncie Products division, secretary; and W. A. FULL, Dean Forge Co., treasurer. Members of the executive committee include SIDNEY SUMMERLEE, Chrysler Corp., Newcastle; A. W. PHELPS, Delco Remy Corp., Anderson; R. S. TINSLEY, Automotive Gear Works, Richmond; F. M. CRAPO, Indiana Steel & Wire Co., Muncie; E. F. DAVIS, Warner Gear Co., Muncie, and F. E. BALL, Ball Bros., Muncie. The first Wednesday of each month was selected as regular meeting night.

Speakers

J. H. FRIEDMAN, vice-president of National Machine Co., Tiffin, Ohio,

spoke on "Machine Forgings" at the regular monthly meeting of the York chapter, A.S.S.T. His talk was illustrated by slides, a motion picture, and a number of typical forgings.

V. P. WEAVER, technical department, American Brass Co., Waterbury, Conn., addressed the regular meeting of Connecticut Non-Ferrous Foundrymen's Assn., at Hotel Garde, New Haven, recently, on "Copper and Its Alloys."

A. H. D'ARCAMBAL, president of the A.S.S.T. and consulting metallurgist of Pratt & Whitney Co., Hartford, Conn.,

spoke on "Tool Steels" before the New York chapter of the A.S.S.T. at its regular monthly meeting Feb. 8.

H. W. MCQUADE, chief metallurgist of Timken-Detroit Axle Co., and chairman of the Detroit chapter, A.S.S.T., spoke on gear steels before the Jan. meeting of the Lansing group of the Detroit chapter. He referred particularly to grain size, normality, treatment for machining, means of making hardness tests, and lubricants for gears.

A. WELLINGTON TAYLOR, dean of the Graduate School of Business Administration, New York University, will speak on "Positive Forces in Business Recovery" at the dinner meeting this evening of Office Executives' Club of New York.

K. V. WHEELER, general manager of Lebanon (Pa.) Steel Foundry, and H. J. ROWE, of the technical control and development section, Aluminum Co. of America, were speakers at the regular monthly meeting of the Pittsburgh Foundrymen's Association held in conjunction with the American Foundrymen's Association at the Fort Pitt Hotel Feb. 15. The subject of the meeting was "Foundry Factors Affecting Casting Design."

Activities

FREDERICK B. COOLEY, president of New York Car Wheel Co., has been appointed chairman for Buffalo's annual joint charities campaign to be held in May.

EUGENE P. FORRESTEL, president of Cold Spring Construction Co., Buffalo and Akron, N. Y., has been elected president of the Bank of Akron, located in the Buffalo suburb of that name.

• OBITUARIES •

JAMES F. BARR, secretary and treasurer, Gear Grinding Machine Co., Detroit, died suddenly at his home there Feb. 15. He joined Manning, Maxwell & Moore in Detroit in 1906, four years later becoming associated with Gear Grinding Machine Co.

EDWARD W. BEACH, 76, vice-president of DeLaval Separator Co., Chicago, died Feb. 10 at Winnetka, Ill. He had been connected with DeLaval for 41 years.

GEORGE J. COOKE, 61, inventor and designer of refrigerating machinery, died Feb. 11 at his home in Chicago.

ALEXANDER Y. CUNNINGHAM, president of American Standard Watch Case Co., Providence, R. I., subsidiary of Bulova Watch Co., died Feb. 15, following a short illness.

VICTOR W. DENTZ, 44, sales manager, Simplicity Mfg. Co., Port Washington, Wis., manufacturer of cylinder grinders and honing machines, died Feb. 11 of pneumonia after a brief illness.

JAMES DAVIS DOWNING, 68, founder and first president of Meadville (Pa.) Malleable Co., died Feb. 4 in Washington, following a six-weeks' illness. He had retired from active business nearly ten years ago.

ALBERT H. FLINT, 64, former president of Norfolk & Western railroad and Manufacturers Aircraft Ass'n, and vice-president of L. W. F. Engineering Corp., aircraft builder, died Feb. 12 at his home in New York.

THOMAS W. GLEESON, veteran inventor at one time associated with ALEXANDER GRAHAM BELL, MOSES G. FARMER and ELISHA GRAY, died suddenly of heart failure Feb. 10 in Boston. At the age of thirteen, Mr. Gleeson went to work for Charles Williams, who conducted the first electrical store in Boston, and it was there that he first met Bell and also Farmer, inventor of the Boston fire alarm system.

RALPH W. E. HAYES, 59, formerly president of Hayes Pump & Planter Co., Galva, Ill., died Feb. 12 at Presbyterian hospital, Chicago. He had retired three years ago at the time of his election as president of the National Association of Farm Equipment Manufacturers, of which he was head for one term. Mr. Hayes was at one time also chief engineer of the farm equipment works, which was founded by his father, and which is now a unit of Farm Tools, Inc., Evansville, Ind.

ALAN F. HILTON, metallurgist of Farrell - Birmingham Co., Ansonia, Conn., died Jan. 23.

EMIL KLUIN, 81, head of the Kluin Brass Foundry, Elizabeth, N. J., died there Feb. 7. He had been a foundryman in this country for the past 40 years.

JOHN O. HORNING, vice-president and treasurer of Mesta Machine Co., Pittsburgh, died Feb. 13 of pneumonia following an operation at Rochester, Minn. He had been affiliated with Mesta Machine Co. for 40 years and was also a director.

WILLARD W. LOW, 75, for many years president of Electric Appliance Co., Chicago, died Feb. 11 in Paris, France, where he had been living since his retirement. He established the Electric Appliance Co. in 1890 after many years as a carriage manufacturer.

WILLIAM L. PATTERSON, 58, director of the technical bureau, Bausch & Lomb Optical Co., Rochester, N. Y., died in his office, Feb. 5. He was an outstanding designer of microscopes and projection apparatus.

WILLIAM H. PENSEYRES, 67, for many years president of Globe Bicycle Works, Buffalo, died suddenly Feb. 13. In recent years he had been head of Buffalo Transit Corp., operating several important bus lines.

LAWRENCE H. POWELL, 49, president of American Stainless Knife Co., Chicago, died Feb. 5.

JOHN M. SATTERFIELD, Buffalo authority on airplane design and construction, died Jan. 31 at his home there following a long illness. He was in charge of the United States airplane depots in France during the War, holding the rank of major.

• MEETINGS •

AMERICAN MANAGEMENT ASSOCIATION
Packaging, packing and shipping exposition, Palmer House, Chicago, Ill., Mar. 7-12, 1932. W. J. Donald, managing director, Room 602, 225 West 64th St., Chicago, or 20 Vesey St., New York.

AMERICAN WELDING SOCIETY
Annual meeting, Engineering Societies Bldg., New York, Apr. 27-29. William T. Spraragen, secretary, 29 W. 39th St., New York City.

FOUNDRY AND INDUSTRIAL EXPOSITION
Also 36th annual convention, American Foundrymen's Ass'n, Philadelphia Municipal Auditorium, May 2-6. C. E. Hoyt, manager, American Foundrymen's Ass'n., Inc., 222 W. Adams St., Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS
Annual meeting, Atlantic City, June 20-24. R. E. Hess, assistant secretary, 1315 Spruce St., Philadelphia, Pa.

NATIONAL MACHINE TOOL BUILDER'S ASS'N
Third National Machine Tool Show, Cleveland (Ohio) Municipal Auditorium, Sept. 10-17. Boyd Fisher, general manager, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio.

NATIONAL METAL CONGRESS & EXPOSITION
174th Regiment Armory, Buffalo, N. Y., Oct. 3-7. Sponsored by A.S.S.T., with cooperation of A.S.M.E., Institute of Metals and Iron & Steel Divisions of A.I.M.E., A.W.S., and the Wire Association. W. H. Eisenman, 7016 Euclid Ave., Cleveland, Director.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Calif., Los Angeles—Los Angeles County Flood Control District, received lowest bid for construction of San Gabriel Dam No. 2 including complete blacksmith and machine shops, six cranes, various capacities, etc., from Merritt-Chapman & Scott Corp., 720 Wilmington-San Pedro Road, San Pedro. Estimated total cost $2,000,000 to $3,000,000.

Calif., Los Angeles—Wood Hydraulic Hoist & Body Co., 1210 Mateo St., awarded contract for construction of a 1 story, 200 x 230 ft. factory at 28th and Santa Fe Sts. $45,000.

Calif., Mare Island (sta. Vallejo)—Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded contract for construction of a battery overhaul shop, sub-station and acid mixing plant at Navy Yard, Submarine Repair Base. $145,000. Noted January 28.

D. C., Washington—D. C. Commissioners, received lowest bid for alterations and extensions to repair shop at 16th St., from Industrial Engineering Co., Washington. $20,582. Noted January 7.

Ia., Marshalltown — Marshalltown Trowel Works, manufacturers of plaster trowels, plans to rebuild warehouse recently destroyed by fire. Estimated cost $30,000.

Ia., Titonka—Chicago, Rock Island & Pacific Ry. Co., La Salle St. Station, 179 West Jackson Blvd., Chicago, Ill., plans to rebuild roundhouse and engine shed here recently destroyed by fire. Estimated cost $35,000.

Ia., Waterloo—Schoitz Tool Gear & Machine Works, Otto A. Schoitz, Pres., 221 Sixth St., plans to remodel recently acquired building into machine shop.

Mass., Springfield—Colonial Beacon Oil Co., 30 Beacham St., Everett, completed plans for a 1 story, 30 x 130 ft. terminal including garage, metal pump house ,loading rack, etc., on Page Blvd. Estimated cost $40,000. Private plans.

Mass., Worcester—Reed & Prince Manufacturing Co., Duncan Ave., manufacturers of screws, will build a plant at Cambridge St. Estimated cost $100,000. E. F. Sill, East Main St., Westboro, Engr. Work will be done by separate contracts.

Me., Lewiston—Wade & Dunton Carriage Co., awarded contract for a 1 story, garage and repair and service station at 26 Park St. Estimated cost $45,000.

N. H., Concord—Aranosian Oil Co., West Concord, receiving bids for construction of 1 and 2 story garage and storehouse. Estimated cost $40,000. N. Simons, 33 North Main St., Archt.

N. J., East Rutherford — J. T. Camlet, 26 Piaget Ave., Clifton, Archt., will receive bids about April 15 for construction of a 2 story factory at 54 Mozart St. for East Rutherford Syringe Co., 75 Mozart St. Estimated cost $50,000.

N. J., Hillside—P. H. Bornstein & Son, 1524 Maple Ave., rejected bids for a 1 and 2 story garage and storage building. Estimated cost $150,000. Joseph Centanni, 142 Market St., Newark, Archt. Will go ahead with smaller project.

N. J., Passaic—Simon Slaff, c/o Preiskel & Skvarla, 631 Main Ave., Archts., having preliminary plans prepared for rebuilding 2 story factory at Highland Ave. and Allen St. destroyed by fire. Estimated cost $40,000.

N. Y., Brooklyn—Arato & Perganio, 418 Vanderbilt Ave., having plans prepared for a 1 story, 64 x 100 ft. service garage at Carlton Ave. and Fulton St. C. P. Cannella, 1163 Herkimer St., Archt.

N. Y., Brooklyn—J. Ballenberg, Kings Highway and Stillwell Ave., having sketches made for a 1 story, 72 x 105 ft. service garage at Kings Highway and West 13th St. Estimated cost to exceed $30,000. H. J. Nurick, 830 Putnam Ave., Archt.

N. Y., Brooklyn—J. Di Pietro, 294 Stanhope St., having preliminary plans prepared for a 1 story, 25 x 100 ft. service garage and shop at Stockholm St. and Irving Ave. A. Jannello, 367 Fulton St., Archt.

N. Y., Brooklyn—Edro Realty Corp., 61st St. and Broadway, New York, having plans made for a 30 x 100 ft. shop for greasing automobiles at Coney Island and Foster Ave. here. J. Eckman, 155 East 42nd St., New York, Archt.

N. Y., Brooklyn—Jacob Mengenthaler's Sons, 663 Sackett St., having plans prepared for extensions to garage and service station at Fourth Ave. and Douglas St. Estimated cost to exceed $20,000. A. Goldberg, 164 Montague St., Archt.

N. Y., Brooklyn—F. W. Plate, 3620 Bedford Ave., plans construction of a 75 x 100 ft. service garage and gas station at 20th Ave. and 57th St. H. M. Sushan, 367 Fulton St., Archt. Project delayed pending issuance of building permit. Maturity late fall. Noted January 28.

N. Y., Laurelton—John Nurro, 224-05 Shaffield Ave., will receive bids late March for construction of a 25 x 84 ft. repair shop for laundry at Westminster Blvd. and 224th St. J. Cahill, 155-28 Jamaica Ave., Jamaica, Archt. Noted February 4.

N. Y., Long Island City—Sarah Bloom, 544 Hegeman Ave., Brooklyn, will build a 1 story, 30 x 64 ft. repair shop, etc., at Conduit and Lansing Aves. here. D. Levinson, Jamaica Ave., Jamaica, Archt. Work will be done by day labor and separate contracts. Maturity about April 1. Noted February 4.

N. Y., New York—Harry Hillerbrand, Fteley and Webster Aves., will build a 25 x 100 ft. automobile service and repair shop.

N. Y., Rock Point—Owner, c/o Edwin P. Bonnet, 263 Bloomfield Ave., Montclair, N. J., Archt., having preliminary plans prepared for a 2 story automobile repair shop and garage here. Estimated cost $40,000.

Pa., Indiana—Indiana State Teachers College, having sketches made for construction of a shop building. Estimated cost $100,000. W. H. Crosby & Co., Oil City, Archts.

R. I., Auburn—Service Battery Shop, receiving bids for construction of a 1 and 2 story service garage and show room. Estimated cost $40,000. F. Chiaverini, 32 Broadway, Providence, is architect.

B. C., New Westminster—Galbraith Ltd., plans reconstruction of sash and door plant. Estimated cost $150,000.

T. H., Pearl Harbor — Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded contract for construction of engine and aircraft overhaul shop at Naval Operating Base. $148,000. Noted February 18.

Equipment Wanted

Mass., Canton—Tobe Deutschman Corp.—seaming machine to seam square and oval cans with height up to 12 in.

Minn., Taylors Falls—James Seed—woodworking machinery including saws, sanders, lathe, etc.

Mo., St. Louis — Gerfen Electric Co., 3869 O'Meara Ave.—screw cutting lathe.

Ont., Kingston—Quibell Co., Kings Wharf—machinery and equipment for proposed shingle mill.

Ont., Niagara Falls—Reid Bros. Lumber Co. Ltd., A. Reid, Pres.—saw mill machinery.

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